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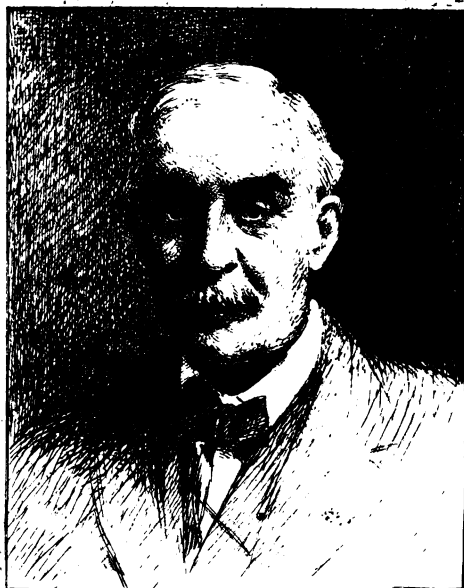
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THE THEORY OF INFERENCE

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THE
THEORY OF INFERENCE

BY THE

REV. HENRY HUGHES, M.A.

AUTHOR OF "PRINCIPLES OF NATURAL AND SUPERNATURAL MORALS"



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P R E F A C E

THIS book, a wholly secular composition, was originally designed to form part of a treatise on religious faith. But it so grew in the course of being written, in material size and intellectual weight, that at length it seemed desirable to publish it as an independent volume.

Although the argument is primarily intended to serve a special purpose, and the form in which it is cast has to a certain extent been determined by that purpose, yet the author ventures to hope that it will be found to have a general and scientific value. He offers it to the thinking public, not merely as a defence and explanation of the habit of assenting to propositions which are not capable of being demonstrated by one man to another, but as an impartial investigation of the whole of that part of mental science which has to do with inference. He has endeavoured to set forth with all needful clearness and precision the nature and the limits of induction and deduction, as well as to vindicate the essential reasonableness of what he has called illation. Induction and deduction, on the one hand, he has sought to exhibit as the kinds of inference which are appropriate to, and only possible in, the field of natural law: illation, on the other hand, he has striven to expound as the

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kind of inference, and the only kind, which leads to the discovery of causes and effects in the field of history. It has seemed to him that, in order to win general acceptance for the theory of illation which it was his primary purpose to establish, it was necessary to make it evident to his readers that induction and deduction are unequal to, and are not as a matter of fact employed in the performance of, the work of drawing conclusions about real and concrete things. And thus it has come to pass that logical inference, from its foundations upwards, has been made the subject of careful and minute investigation.

The book being such as has been described, the author asks for it the attention of other readers besides those scientifically interested in the question of religious faith. He thinks that it may prove to be of use, not only to the theologian, but also to the general student of logic and philosophy.

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THE THEORY OF INFERENCE

CHAPTER I.

CAUSATION.

I. THE reader is invited to enter upon the difficult but interesting task of investigating the action of the human mind in making inferences. Not merely as a useful study in mental science is this large undertaking put before him; it is proposed, especially, as a means to understanding and appreciating the essential reasonableness of religious faith. For faith, in one of its most important aspects, is unqualified and unconditional assent to certain undemonstrable facts and doctrines. And in order to show as convincingly as possible that such kind of assent is not in itself an irrational procedure, it is necessary to exhibit it in relation to the movements which the mind makes when it assents to conclusions that satisfy the recognised formulas of logic. Thus, on the one hand, will appear more plainly the nature and the validity of the assent in question; and thus, on the other hand, the inadequacy of logical methods to lead to and account for even that near approximation to it which is accounted reasonable will become manifest. Endeavour will be made in this treatise to exhibit clearly these two facts:—that the mind may give to undemon-

strable propositions about concrete things a rational assent which is much more than an assent to them as very highly probable ; and that not even their very high probability can be inferred by means of any formulas of the ordinary logic.

In an age when the thoughts of men are largely turned to the study of laws of nature, and they have learned to appreciate the importance of using with due precision the methods of inference recognised in logic, it is not, perhaps, surprising that they should look with suspicion upon propositions which are incapable of logical demonstration. Momentous doctrines are offered for their acceptance without, as it appears to them, any such evidence as amounts to proof. They feel that in physical investigation to place implicit credence in propositions thus presented to them would be an act of folly. How then, they ask, can these alleged truths of religion be unhesitatingly accepted by thinking men ?

(In physical science a conclusion, in order that it may be generally received as true, must be presented as having been reached by a way of inference over which any other man may travel, or which he may picture to himself as having been travelled over by the original investigator. In physical science facts and arguments are, so to speak, the common property of many, if not of all: the same conclusions are regarded as being drawn, or as capable of being drawn, by many, if not by all, from precisely the same facts by means of precisely the same modes of argument. Hence a fact or doctrine of religion—merely because its advocate cannot, by addressing himself to the intuition and the senses and the logical understanding of any interlocutor, demonstrate to him how step by step his conclusion has been reached—is apt to be looked upon as one which is at the best no more than very highly probable, as one to which no soundly reasoning man could possibly

accord an unqualified and unconditional assent. A proposition, conviction of whose truth can be arrived at only by a path more or less private and peculiar to each individual inquirer, is apt to be regarded as having necessarily no certain claim to the adhesion of any sound logician. And a person in the present day, permeated with or assuming the tone of thought appropriate to investigation in the domain of physical science, may thus on grounds of reasonableness, as he would have it appear, refuse to give credence to, or may begin to have misgivings about, the teachings of Christianity. In proportion, therefore, as we hold that assent to the truths of Christianity is a matter of immense importance, we must, it would seem, hold it to be important that it should plainly appear that full acceptance of them is not in itself an unreasonable course of conduct.

But let it be noted, that it is not by any means in relation to all matters that there is any wide-spread disposition to contest the validity of inferences merely because they are not made according to the rules of logic. In the ordinary concerns of common life, even persons most wedded to logical methods of ascertaining truth do habitually give their full assent to facts and propositions which they cannot prove. Of this there can, apparently, be no possible doubt. Who is there, for example, who does not entertain a firm conviction of the truth of some such propositions as the following:—that his children love him, or that his friend is worthy of being trusted, or that he himself was born in a certain year at a certain place, or that a battle was once fought between England and France at Waterloo, or that a person named Marcus Aurelius was an emperor of Rome? And yet of these propositions no strict proof, in a logical sense, is possible; no proof which would not involve assumptions, themselves neither matters of immediate knowledge nor capable of being absolutely proved.

We might well argue, therefore, that, since persons endowed with high powers of reasoning do habitually assent to propositions other than those which can be strictly demonstrated, there can really be no question that such a procedure in relation to matters of religion is entirely legitimate, and not in the least unworthy of a philosophic mind. Nevertheless, this argument, though obvious and apparently unanswerable, seems practically insufficient to overthrow men's contrary opinions.

II. Wishing, then, to obtain as clear and intimate a view as may be possible of the philosophic reasonableness of inferring and believing facts that lie outside the range both of immediate knowledge and of logical demonstration, we may proceed to examine the various movements of the mind in making inferences. We may proceed to investigate the laws which govern it in passing from knowledge of one or more facts or truths to the consequent knowledge of some other fact or truth. Our starting-point will be the mind's position, so to speak, when it is ready to make its first inference. We suppose it to have acquired a certain stock of ideas such as are the objects of immediate knowledge, ideas which come to it directly, whether by intuition or sensation. There is no occasion for us to go behind this position, penetrating into the inner regions of metaphysics, and opening up the whole question of the origin of ideas. The subject of our inquiry is not mental science in general, but only that part of mental science which has to do with inference. And, provided it be understood that we are contemplating the mind's position at a time when as yet it has made no inferences, when whatever ideas it may possess belong in some way or other to the region of immediate knowledge, it is immaterial to us in what precise manner these ideas have been acquired.

Nor need we (except in special cases afterwards to be

mentioned) concern ourselves with the further question whether certain elementary and axiomatic truths—such, for example, as that three and four are seven, or that two straight lines cannot enclose a space—are truths of immediate knowledge, or whether they are reached by inference in the obscure time of the mind's first making itself acquainted with the external world. If these or any other first principles of science have been reached by inference, still there must have been an earlier time in the mind's history when its knowledge was wholly independent of its power of inferring. And from this earlier time our inquiry makes its start.

We need not, as has been explained, in fixing upon a starting-point for our investigation, go farther back in the mind's history than to the time just preceding its beginning to infer. It is, however, quite necessary that we should go back thus far. Or—and this is practically the same thing—we must at least conceive the mind, in whatever period of its history it may be, as making inferences without any dependence whatever upon ideas that have been obtained by means of former inferences. We must conceive it as using for its instruments or for its guides only such ideas as are in one way or another the objects of immediate knowledge. Unless we thus divest the mind of all ideas and axioms which have themselves been gained by inference, and which, having been once gained, might seem to be employed as useful aids to making further inferences, it might be expected to be extremely difficult, if not impossible, to trace the natural and original course taken by the mind in passing from the apprehension of one or more facts to the consequent apprehension of another. If we were to contemplate the mind as entertaining, while engaged in inference, one or more ideas, which, though made use of, are not essential to the act, it might be expected to be

extremely difficult, if not impossible, to expose fully to view that wherein lies the essence of inferring, that which the mind necessarily does on every occasion when an inference is made.

If, in seeking to divest the mind, within the sphere of its operations of inferring, of all previously inferred ideas, we should meet with one or more ideas which we find not only useful but indispensable means to an act of inference; if, notwithstanding any seeming likelihood of their having been obtained by inference, we should find ourselves unable to conceive of a real inference being made independently of them; how is it reasonable to regard them? Must we not conclude that any presumption in favour of their being inferred ideas is misleading, and that they are in fact a part of the mind's immediately acquired stock of knowledge? If they are inferred, we must put them away; if we cannot put them away, they are not inferred.

Now the principle of causation is, in relation to all inferences, one such necessary idea. And the principle of uniformity in nature is, in relation to one class of inferences, another. Every phenomenon, we say, is the effect of some cause, and the cause or condition of some effect. And similar causes, we say, produce similar effects, while similar effects are the products of similar causes. These propositions, expressing correctly (it is here maintained) the two ideas, may be described as axiomatic truths. And with regard to them it is necessary to our purpose—as it is not in the case of most other axioms—to discuss their origin as acquisitions of the human mind. The view that will be taken of them is, as was suggested above, that they are objects of immediate knowledge; the former, that is, being an idea antecedent to all inference whatsoever, the latter to all inference that depends upon it. If this view were generally accepted, discussion of it would lie outside the

limits of this treatise. Well-known writers, however, on philosophic subjects contend that the law of uniform causation—corresponding in the main to the aforesaid principles—is itself an inference from uniform experience. It thus becomes necessary to make a serious attempt to show that the principles in question have in fact another origin.

And here it may be stated that the investigation upon which we are engaged will be carried on for some time with much explicit reference to J. S. Mill's views concerning inference. As a foremost champion of the position, that conclusions which are incapable of being established by the methods of logic have no proper claim to be implicitly believed, his main contentions require and deserve to be thoroughly examined. If they can be shown to be erroneous, the way will be very considerably cleared for the favourable reception of a constructive argument in support of the opposing thesis. Together, then, with direct investigation of our subject—which will issue, it is hoped, in our obtaining a satisfactory view, on the positive side, of the reasonableness of assenting to undemonstrable propositions—critical attention will be devoted to those of Mill's arguments which seem, in relation to our thesis, to be the most dangerous and destructive.

III. We are called upon, then, to institute an inquiry into the origin, first, of the idea of causation, and secondly, of the idea of uniformity in nature. Further, it seems to be most desirable, if indeed it is not necessary, that some clear and full account should be before us of the meaning of the relation between effect and cause. Accordingly we may now proceed to consider with some care what is the origin, and what the meaning, of the idea or principle that every phenomenon is the effect of some cause and the cause or condition of some effect.

To questions such as the following—why does an oak-

tree shed its fruit in autumn? why does a pond dry up in summer? why do birds build nests in spring? why does a person take food when he is hungry? why is it the lot of man to suffer pain?—four different kinds of answers may be given, each kind containing its own conception of causation. The inquirer is regarding the phenomenon, of which he speaks, as the effect of some cause, as standing in some relation of seeming dependence to something outside itself; and he is seeking to ascertain the nature of this cause, and of this relation of dependence. And a person who replies to him may indicate any one of four quite different kinds of cause, any one of four quite different modes of accounting for the phenomenon.

Three of these modes have reference to the Power that manifests itself in nature. In order to preserve the secular character of this treatise, it will perhaps be well to personify nature, and speak of this Power simply as nature. The meaning of what is said concerning cause will—relatively to the main subject of our investigation—be unaffected by this mode of speaking. With this preliminary observation we proceed to notice the four kinds of answer that may be given.

1. A person intent upon magnifying nature as an operating agent may reply to each question, Nature has willed that it should be so. Phenomena being thus referred to nature, as having in her will their final and sufficient explanation, she is, in the technical language of philosophy, their efficient cause.

2. Or a person having the operating agency of nature in his mind, and being at the same time impressed with the evidences of purpose and design which he sees around him, may prefer to account for a phenomenon by exhibiting it as a means to some given end. An oak-tree, he may say, sheds its fruit, partly in order that new trees may spring up, and partly in order that animals may find food;

a pond dries up, in order that thus the earth may be supplied with rain in due season; birds build nests, in order that their young may be safely hatched and reared; man is supplied with food for the satisfaction of his appetite, in order that he may find enjoyment in an act which is necessary to sustain his vigour; pain is inflicted upon man, in order that character may be disciplined and wrong-doing checked. The definite purpose which nature is thus considered to have in view, in designing and ordering the phenomena of the world, is termed the final cause.

3. Again, a person having some knowledge of relations of dependence seen to exist between one phenomenon and another may point to some particular phenomenon, as containing in itself an answer to the question. Thus he may account for the oak-tree shedding its fruit, by saying that the bond which unites the fruit to the tree is gradually relaxed as the year progresses, until at length the wind and rain of autumn sever it altogether; for the drying up of the pond, by saying that water evaporates under the influence of the sun's heat; for the birds building nests, by saying that they are moved thereto by a force within them which is spoken of as instinct; for persons eating when they are hungry, by saying that the desire to eat is a motive acting on the will and inducing it to resolve upon the necessary steps for giving satisfaction to the desire; for its being the lot of man to suffer pain, by saying that pain is often the manifest consequence of inattention to the laws of physical well-being. The phenomenon thus adduced, as being in some way an explanatory phenomenon, may be called the phenomenal cause.

4. Lastly, if a person should have in mind the general idea of an order of nature regulating the dependence of one phenomenon upon another, he may, instead of pointing to a phenomenon which seems to contain in itself an answer

to the question, express his conviction that an explanatory phenomenon somewhere has existence. He may, while perhaps admitting that he cannot see behind the phenomenon which is the subject of the question, assert that there is, nevertheless, a phenomenon somewhere behind it to which, by the design of nature, it stands in a relation of dependence. In other words, he may reply that it is natural, or in accordance with relations of dependence that exist in nature, that this or that event should happen. It is natural, he may be supposed to say, that a tree should shed its fruit, that water should dry up, that a bird should build a nest, that a person being hungry should partake of food, that a man should often be obliged to suffer pain. The design of nature, thus regarded as containing somewhere in itself a phenomenal explanation of an observed event—or, which is nearly the same thing, the alleged naturalness of the event happening when and as it does—may be designated the formal cause.

IV. The general remark being made, that of the four types of answer just considered, one will seem, in any particular case, more pertinent than another according to the nature of the subject and the mental standpoint of the two interlocutors, we proceed to notice some points in connection with them.

Our investigation does not require that anything further should be said concerning the efficient cause, and the final cause, of any phenomenon. It may, however, be observed that not nature alone, and nature's purpose, but man also, and man's purpose, are capable of being thus spoken of; if, that is, as believers in free-will, we credit man with being endowed with some absolute power of initiating action. Thus man, eating when he is hungry, may be regarded as to some extent resolving to do so independently of the influence of appetite upon the will. And he may be regarded as to

some extent resolving to do so in order to fulfil a purpose which he has made his own.

With reference to the formal cause, it must be pointed out that the way in which the term is here employed, to signify design in the mind of nature, is not quite in accord with the definition of it usually given. The idea, it is said, in a sculptor's mind is the formal cause of the statue he has made; the plan in an architect's mind is the formal cause of the house he has erected. But in the discussion of the preceding section nature is regarded as the sole artificer, and the motives and actions of man—(his freedom of will not being taken into account)—are reckoned among her phenomena. Moreover, it is not merely nature's planning an event to happen, but nature's planning it to happen in consequence of some antecedent phenomenon, that is looked upon as constituting its formal cause. The term is thus not strictly applicable to the design of man, even in so far as he is free to execute his design. For it is not within his power to determine what kinds of antecedent shall be the phenomenal causes of his realised idea.

The term phenomenal cause, it may next be remarked, has not, perhaps, a recognised place in mental philosophy. Nevertheless, in the absence of a better, it seems convenient to employ it here. It distinctly points, as it is intended that it should point, to some phenomenon as the cause of a given effect; and it is sufficiently general to include all possible varieties of this kind of cause. As, however, it is with this cause alone that our argument is much concerned, it will, in general, be unnecessary to speak of it by the full name: it may, when it is quite evident that no one of the three other kinds is referred to, be spoken of simply as the cause, without the prefix of the distinctive adjective.

Let us now turn to the various instances of phenomenal cause suggested by way of answer to the questions of the

preceding section. We seem to have (1) decay, wind, and gravitation, all gradually loosening the hold of fruit upon a tree; (2) heat vaporising water; (3) instinct inciting birds to active effort; (4) a desire producing through the intervention of the will various movements of the human body; (5) some of the forces of which vital energy is composed acting, in consequence of improper treatment, irregularly in the physical organism, whether in excess or in defect. Now a careful examination of these instances seems to show that one kind of idea, whether in a positive or in a negative form, is present in and gives character to them all. In wind and gravitation acting on the stalk of fruit, in heat acting on water, in instinct acting on the limbs of birds, in will incited by desire acting on man's bodily frame, in some part of vital energy operating in excess:—in all these we seem to find different expressions of one and the same idea; all appear to be but different manifestations of one and the same thing, namely, force acting upon matter. And the decay of an acorn's stalk, and the failure of some part of vital energy to act efficiently, seem to signify but the absence of this one thing, the absence of that which has hitherto been present, namely, force—here a quickening and health-sustaining force—acting upon matter.

From these five instances, not at all selected with any special view to making good this point, it would seem as if an approximately true definition of a positive cause is, force acting upon matter; and of a negative cause, force ceasing to act upon matter. And this twofold description, positive and negative, seems to cover sufficiently well for the purpose of our argument the whole body of causes. Without professing to be strictly applicable to each without exception, it represents correctly their general character, and gives the needful definiteness to thought.

It will perhaps further tend to clearness of view, if we

can now find for the phenomena which we call effects or consequences some simple conception which shall include them all. In the illustrations that have been given we have the following effects:—an acorn falling from a tree, water assuming the form of vapour, a bird engaged in building its nest, a person taking food, another suffering pain. Can these be included in some one idea? An idea which apparently includes them all, and which seems to be sufficiently definite for our purpose, is that of an active or passive state of being. And this conception of effect will apparently cover all phenomena whatsoever, all facts and events of which we become cognisant.

We may consider, then, cause to be force acting (or ceasing to act) on matter, and producing (or ceasing to produce) an active or passive state of being.

V. We now come to the crucial questions of a theory of causation. What is the origin of this idea or principle of causation in the human mind? And what is the true character of the relation of dependence between effect and cause?

As regards the origin of the idea of causation, or the path by which there first enters into the mind a conviction that any phenomenon taken note of is dependent upon some other, and has some other dependent on it, all that we are here concerned to know is, that the mind becomes possessed of the idea before it has in any way exercised its power of making inferences. The idea of causation, it is here maintained, is an essential means to the making any real inference whatsoever; and therefore it must be insisted on, as a fact of human nature, that it is in some way an object of immediate knowledge. Further than this it is not necessary that we should inquire.

Mill, however, holds that the conception arises from observation of a number of similar pairs of consecutive

phenomena; *a* being seen time after time to be followed by *b*, until at length *b* is looked upon as standing to *a* in the relation of effect to cause. The difficulties which beset this theory we shall have to notice presently. At present it is sufficient to remark that it derives the conception of cause and effect in general from the mind's acquaintance with the repetition of particular sequences. But the view which it is necessary to the success of our argument that we should be able to take is, that the conception is essentially independent of such knowledge. It is contended that if the mind had no experience of the repetition of phenomena; if each phenomenon as it occurred was invariably something new; yet it would be in some measure aware, at a very early period indeed of its development, that there is somewhere among things and movements external to itself a precedent explanation of any particular thing or movement which it sees. And also it would be aware, though perhaps at a less early period, that some change of circumstances arises as the consequence of any particular exercise of force which it observes. The human mind, it is maintained, begins at a very early period of its existence—before it can have learned by any experience to associate phenomena in pairs—to seek for the fellow, so to speak, of any one by which it is impressed. It is somehow conscious, apart from any teaching of experience, that any given phenomenon has its explanation in some other upon which it is dependent, or in some other which is dependent on it. It anticipates a relation of dependence between the thing it sees and some other portion of the world around it.

This view seems to account satisfactorily for the constant questionings and the practical curiosity of childhood; it seems, as perhaps will become apparent, to be a basis on which a consistent theory of inference can be erected; and it seems to be free from logical difficulties such as

those with which, as we shall see, Mill's exposition is encumbered.

VI. Passing to the second of the two questions, we at once see that the relation of effect to cause is, in part, one of succession in time. Effect is certainly conceived of as coming after cause in point of time, though the interval between them may be in some cases inappreciably small. Thus far we are in accord with Mill, who describes cause as the unconditional invariable antecedent. He, however, maintains that conception of this relation is derived solely from experience of similar pairs of consecutive phenomena, and is thus a conception of succession only. A more correct view seems to be that, as the existence of cause and the existence of effect, so the relation of effect to cause is a matter which would be equally apprehended by the mind if all phenomena were but of single occurrence. The true relation appears to be one of absolute dependence; one of procession from, not of mere succession to. A cause is not merely that which is, according to experience, the unconditional invariable antecedent; but it is that without which the consequent could not possibly exist. It appears to be the case that there is a certain true sense in which the effect or consequent is an actual portion of the cause. The phenomenon, consisting of force acting upon matter, which constitutes the cause, seems to expend and part with a portion of its own energy in producing the state of being which constitutes the effect.

The relation of effect to cause must indeed, if the conception of it is derived otherwise than from experience of repeated sequences, be something more than one of mere succession. For a single instance of a phenomenon would stand in this same relation of mere succession to every other phenomenon that has gone before. To that immediately preceding it, it has a relation of succession which

is certainly unique; but immediate succession is clearly no necessary part of the conception of the relation of effect to cause. No doubt every phenomenon is immediately preceded by a cause; but it is by no means always to this immediate cause that the mind looks, or is able to look, as containing the explanation of it. If, for example, we affirm that eating unripe fruit creates gastric disturbance, or that a good education makes a man a useful citizen, we by no means intend to imply that the cause is immediately followed by its effect: there intervene other causes set in motion by the first. An explanatory cause may be separated by some interval of time and by a chain of intervening causes from the phenomenon which it explains. Every effect has, indeed, an ancestry of causes, and every cause a posterity of effects; and the mind fixes its attention upon one cause or one effect, rather than another, as *the* cause or *the* effect, according to the circumstances of any given case.

The view thus taken—that the relation of effect to cause is one of procession, and not of succession only—seems to be essential to a sound theory of inference; while that which it opposes appears to be incapable of being sustained. It is not, be it understood, by any means asserted that, when we think of cause and effect, the idea of procession is invariably present in the consciousness. For some purposes, perhaps, we do not seek to penetrate beneath the superficial notion of succession. But it is contended that for the establishment of an exhaustive and consistent theory of inference there is need to penetrate; and that, when we do penetrate, we find that the root idea, from which that of succession springs, is the idea of effect proceeding forth from cause.

Further, this procession seems to be apprehended as taking place in accordance with the design of nature. That which the mature mind distinctly recognises as the formal

cause of every phenomenon—viz., the plan or the orderly design of nature, in accordance with which the phenomenon follows upon some chosen antecedent—appears to be no less an essential part of a full conception of causation than is the procession of effect from cause. A given effect is apprehended as proceeding from its own cause, and a given cause as producing its own effect, not by any haphazard, but because it belongs to the settled order of the world that things should make their appearance as they do. Conception of a relation between effect and cause, other than one of immediate succession or of observed invariable succession, would, indeed, seem to be impossible except on the hypothesis—however feebly it may be grasped—of a designing mind manifesting itself in all phenomena of nature. If we reject these notions of succession as explaining the relation, the idea of purpose and design in nature seems, together with that of procession, to be forced upon us. Together with apprehension that an observed event has proceeded from some cause, or will be productive of some consequence, there seems necessarily to be an apprehension also, in however inchoate a form, that it is according to the settled order and the design of nature, according to the constitution of things as in themselves they are, that it has proceeded from that which has produced it, or will produce that which will be its consequence.

VII. Entertaining the conception of causation, as a relation of procession of effect from cause, the mind seems prepared to receive very readily the further notion of a particular event having its origin in some particular assignable cause, and of a particular manifestation of energy producing some particular assignable effect. Some conspicuous antecedent in close proximity to a phenomenon it easily welcomes as the explanatory cause; some notable consequent occurring shortly after it, it easily regards as the

anticipated effect. Let us suppose, for example, a person to take notice of the fact that a peal of thunder has been immediately preceded by a flash of lightning, or that a sensation of bodily pain has been immediately preceded by the reception of a blow. Then his mind, trying in the exercise of its natural activity to account to itself for the occurrence of the thunder or of the feeling of pain, is likely enough to see in the lightning the source of the one, or in the blow the origin of the other. Observation is likely enough to mark the antecedent named as the explanatory cause, to which the existence of the effect is due. Or again, let us suppose a person to have bitten an apple and experienced immediately afterwards a sensation of sweetness, or to have listened in the night to the roaring of the wind and discovered in the morning that a tree has been uprooted. Having a conception of causation, he is likely enough to see in the sensation of sweetness something created by the biting of the apple, and to recognise in the uprooting of the tree the work accomplished by the storm of wind.

What has been said must not be taken to imply, that the mind consciously entertains the idea of causation for any length of time before it has cognisance of particular causes and particular effects. It may even be that it first awakens to the idea in consequence of observing together the two phenomena to which it first assigns the relation of effect and cause. But it is contended that there is some interval of time, however inappreciably small, between recognition of the fact that the one phenomenon has a cause, or has an effect, and recognition of the fact, or supposed fact, that the other is the cause, or is the effect; the two acts of recognition occurring in the order given. The course of reasoning certainly appears to be, B has a cause and A is its cause, or A has an effect and B is its effect; not, A and B are related, and the relation is one of cause and effect.

The latter argument, though no doubt a reasonable one, would seem to belong to a much later period of the mind's development, implying, as it does, acquaintance with, and comparison between, various possible relations among phenomena.

It may be worth while to remark, in conclusion, that it appears to be more congenial to the human mind to start from an effect and travel backwards to its cause, than it is to start from a cause and travel forwards to its effect. As in the case of persons, so in the case of phenomena in general, it is their ancestry, rather than their posterity, in which the inquiring mind is chiefly interested. Phenomena which attract attention to themselves in their aspect of effects seem to be commonly selected by the mind for investigation, in preference to those which present themselves as causes.

CHAPTER II.

UNIFORMITY IN NATURE.

I. WE have supposed the mind to have reached the stage of ascertaining by observation—whether faultily or correctly, whether tentatively or certainly, we need not consider—that some particular manifestation of force is the cause of some particular state of being, or that some particular state of being is the effect of some particular manifestation of force. And we have supposed it to be conscious that the effect has its origin in the cause, or that the cause gives birth to the effect, in accordance with the settled order and constitution of the world.

The conception of particular cause and particular effect being thus linked together in the design of nature, the conception of them as partaking of a common orderly existence, as constituting together (we might almost say) a natural organic whole, seems to include yet another conception of the relation between them, besides that, already noticed, of the one being followed by the other in point of time. It seems to include the conception of the relation being, relatively to all outside them, independent of time and place. Whenever and wherever, during the reign and in the realm of nature, the particular effect might have been found, its cause must have been the same; and whenever and wherever the particular cause might have been observed in action, it must have produced the same effect. Into the mind's conception

of the one being naturally and necessarily followed by the other, time and place do not appear to enter. The two phenomena are inseparable: the existence of either, as a part of nature, at any time and at any place necessarily involves the existence of the other. That the mind which has marked the cause of some effect, or the effect of some cause, should conceive that it has marked it because the time is 'now' and the place 'here,' would seem to be impossible.

II. In what has just been said there seems to be virtually contained the principle of uniformity in nature. Apparently, the mind has but to recognise a second effect precisely similar to the first, in order to know that it must have been produced by a second cause precisely similar to the first; or to recognise a second cause precisely similar to the first, in order to know that it must give rise to a second effect precisely similar to the first. For the mental picture of a second effect or cause precisely similar to the first would seem to be undistinguishable from the mental picture of the first divested of conditions of time and place. And the mental picture of the corresponding cause or effect, necessarily rising in association with the picture of the first effect or cause, would indicate also a cause of the second effect, or an effect of the second cause, precisely similar to the first. The mind, having once associated together a particular cause and particular effect, has virtually associated all effects precisely similar to the effect with causes precisely similar to the cause, and all causes precisely similar to the cause with effects precisely similar to the effect. It knows of each particular cause and of each particular effect, as it comes to be acquainted with them and contemplates the existence of others like them, that there is in their case uniformity in nature.

When particular similar causes or similar effects are

under contemplation, so immediate and inevitable does the conclusion—that similar effects will follow, or that similar causes have gone before—appear to be, that it may almost be accounted a necessary part of the conception of the similarity of the causes or of the effects. At all events, it seems to afford a sufficient test of similarity. And the general or universal statement, that all similar causes or effects produce or are produced by similar effects or causes, seems to be, in respect of the ground we have for making it, a statement of much the same character as, that all rivers are composed of flowing water, and that all branches are offshoots from the trunks of trees. As water that does not flow is not what we mean by a river, and wood taken from the trunk itself is not what we call a branch, so a pair of causes giving rise to dissimilar effects, or a pair of effects proceeding from dissimilar causes, is not what we understand by a pair of similar causes, or a pair of similar effects.

But, though the idea of similarity of effects practically becomes a part of the conception of similar causes, and *vice versa*, it cannot, apparently, be said to be contained in the first conception of them. There seems to be a distinct onward movement of the mind from the apprehension of the fact that a particular wind, for example, has blown down a particular tree to apprehension of the fact, that the next wind observed to be blowing under similar conditions will uproot any tree that happens to be similarly situated, or that the next tree found to be similarly uprooted has been blown down by a similar wind. The movement is indeed a necessary movement, so soon as the notion of the second wind as a similar cause, or of the uprooting of the second tree as a similar effect, enters the mind; but nevertheless it is a movement. It is a movement from the known to the hitherto unknown; a movement by which the mind, availing itself of the fact that throughout nature there are repetitions

of causes and of effects, passes from the knowledge of a causal relation between two consecutive phenomena, and the knowledge of a third phenomenon similar to one of them, to knowledge of a fourth similar to the other. Such a movement, concerning which more will have to be said in following chapters, we may speak of as an act of deductive inference.

The reader may here be referred to Charles Lamb's well-known essay on *Roast Pig* for a very graphic illustration of early marking, by means of observation, the cause of an effect, and inferring that a repetition of the cause will be associated with a repetition of the effect. It would serve to enliven this discussion to quote the story in full in these pages, but unfortunately it is much too long. The substance of it is as follows. A swineherd's hut, containing a litter of new-farrowed pigs, having been accidentally set on fire by his son, the luxury of roast pig was thereby for the first time discovered. It being concluded by the swineherd and his son that the cause of this most agreeable phenomenon was the burning of a hut containing a litter of pigs, it is perceived by them—whether reasoning from similar cause to similar effect, or from similar effect to similar cause—that, if any other hut with a litter of pigs in it were set on fire, a similar result will be produced. Accordingly, “as often as the sow farrowed, so sure was the house of Ho-ti to be in a blaze.” The neighbours learn the secret, and follow the example of Ho-ti and his son, and “this custom of firing houses continued, till in process of time a sage arose who made a discovery that the flesh of swine, or indeed of any other animal, might be cooked without the necessity of consuming a whole house to dress it.”

III. If the exposition which has been given of the two principles of causation and uniformity in nature commends

itself as reasonable, Mill's views, being in opposition to it, must be dissented from. But not on this account only is it suggested that they are unsound. A more convincing reason for holding them to be erroneous is, that they contain internal inconsistencies, from which he vainly seeks to show that they are free. If this position can be made good, if independently of the argument of these chapters it can be shown that a certain opposite theory cannot be successfully maintained, we shall have indirect evidence in favour of the theory expounded here, additional to whatever direct evidence the exposition itself may seem to contain. And since a true theory of causation and uniformity may be said to be an essential part of a true theory of inference, it is important for the establishment of the main thesis of this book that this indirect evidence should not be neglected.

Now Mill's contention is, that the idea of causation is derived from experience of the uniform course of nature. Instead of causation being, as has been here represented, the designed procession of one phenomenon from another—a conception leading on to the conception of a uniformity in nature which is a uniformity of procession—instead of this, uniformity in nature is, with Mill, an observed fact, and is no more than a uniformity of succession. And the principle of causation is only a particular expression or enunciation of this fact of uniformity of succession. Causation is but the invariable relation of sequence seen, or inferred, to exist between any two phenomena. One phenomenon is perceived to be invariably followed by another; and, this being so, the antecedent is termed the cause, and the consequent the effect. "The only notion of a cause which the theory of induction requires is such a notion as can be gained by experience. The Law of Causation, the recognition of which is the main pillar of inductive science, is but the familiar truth that invariability

of succession is found by observation to obtain between every fact in nature and some other fact which has preceded it, independently of all considerations respecting the ultimate mode of production of phenomena, and of every other question regarding the nature of 'Things in themselves.'"¹

We have now to note with the greatest care the meaning which is to be attached to the words observation and experience. In a strict and proper sense, they have reference only to things that have already presented themselves as apparent to the intelligence. Experience is of things that have been actually experienced, and observation is of things that have been actually observed. There is, however, a looser way of employing these terms, in which they are made to cover a wider range. Thus we may say, Experience teaches me that if I eat this kind of food it will make me ill, or, Observation shows that no self-seeking man can at all times be relied on. Here it will be seen that the terms in question are used to cover facts other than those which they strictly refer to. There is, together with a statement of certain known facts, an inference from them to other contemplated facts. In strict language, experience only teaches a person that a certain kind of food has made him or others ill in time past; and he infers that it will, if now partaken of, also make him ill in the future. Observation only teaches a person that among the self-seeking men he is acquainted with, there is not one who is always to be relied on; and he infers that any other self-seeker, whoever he may be, is similarly unreliable. There is in either case a passage of the mind from the known to the unknown.

In which, then, of the two senses are we to understand the terms in the above passage? Mill, as we shall see, would decline to acknowledge that common-place predictions

¹ *A System of Logic*, by John Stuart Mill, Bk. III. ch. v. § 2.

or generalisations of the kind just noticed are valid inductive inferences, resting, as such, on a recognition of causation. But let it be observed, that this is a crucial question of a theory of inference, and that the correctness of his view can by no means be admitted. It will here be maintained, that any real inference whatsoever, not merely is not valid, but is not even possible, apart from a conception of causation. To understand, therefore, Mill as using, in a first description of causation as the basis of true inference, certain terms in a loose sense implying that inferences of some kind form a part of the conception of causation, would be to see in his argument an altogether inadmissible *petitio principii*. And let it be further noted that he appears in general to be anxious to insist on the sufficiency of sense experiences, to the exclusion of innate ideas, to account for men's conceptions of nature's order. Under these circumstances we are surely entitled—nay, we may indeed regard ourselves as bound—even if we are not altogether intended, to consider that he is here declaring actual experience to be the basis of the conception of causation, and that he is not introducing into the conception any kind of innate or of inferred idea. Upon the two grounds indicated we may reasonably interpret the terms experience and observation, in the passage before us, in their literal and simple sense, and we may reasonably refuse to interpret them in any other.

Nevertheless, Mill endeavours to show that the true principle of causation, while it is derived from experience and observation, and while it is the necessary basis of inductive inference, contains more than the direct results of experience and observation. Having, in effect, asserted that the true conception is one of experienced and observed succession, not of imagined procession, he claims for this conception that it none the less includes the ideas of neces-

sity and universality, ideas upon which inductive inferences are founded. A cause, he holds, is an antecedent which, not only has been, but must always be, followed by a certain consequent. Not only among observed phenomena, he holds, but among all phenomena whatsoever, there is a certain necessary sequence. "To certain facts, certain facts always do, and, as we believe, will continue to, succeed. The invariable antecedent is termed the cause; the invariable consequent the effect. And the universality of the law of causation consists in this, that every consequent is connected in this manner with some particular antecedent or set of antecedents. Let the fact be what it may, if it has begun to exist, it was preceded by some fact or facts with which it is invariably connected. For every event there exists some combination of objects or events, some given concurrence of circumstances, positive and negative, the occurrence of which is always followed by that phenomenon."¹

Parenthetically, another objection to Mill's theory of causation may here be pointed out. He is careful, it will be noticed, to speak of the necessary and universal relation of causation as if it were only half of what in truth it seems to be. He holds that a cause is invariably followed by its own particular effect, but he does not hold that an effect is invariably preceded by its own particular cause. "To certain facts," he says, "certain facts always do, and, as we believe, will continue to, succeed;" but he avoids saying, "By certain facts certain facts always are, and, as we believe, will continue to be, preceded." Discussion of this point will be better reserved for another section.

Let us now return to the consideration of his strange position, that a cause, on becoming known to the mind solely by experience and observation as an invariable antecedent, at the same time becomes known to it as the antecedent of

¹ Bk. III. ch. v. § 2.

a necessary consequent. We are not yet prepared to take in hand the further question of universality—the question, that is, how, in his view, experience and observation teach that to every phenomenon whatsoever throughout nature there is a cause, an antecedent which is invariably followed by a similar effect.

The proposition, A always has been followed by *a*, includes the proposition, A always will be followed by *a*. “To certain facts, certain facts always do, and, as we believe, will continue to, succeed.” This idea, not only of an observed, but of a necessary relation between cause and effect, is without doubt a part of men’s actual conception of causation, and it is a part which is essential to it as the basis of a certain class of acts of inference. But, unless the conception of causation is derived otherwise than from experience, it seems impossible to account for this idea of necessity which enters into it. Let us, however, see how far Mill succeeds in what appears to be the hopeless endeavour to show that the idea is in fact a product of experience. He writes as follows :—

“When we define the cause of anything (in the only sense in which the present inquiry has any concern with causes) to be ‘the antecedent which it invariably follows,’ we do not use this phrase as exactly synonymous with ‘the antecedent which it invariably *has* followed in our past experience.’ Such a mode of conceiving causation would be liable to the objection very plausibly urged by Dr. Reid, namely, that according to this doctrine night must be the cause of day, and day the cause of night; since these phenomena have invariably succeeded one another from the beginning of the world. But it is necessary to our using the word cause that we should believe not only that the antecedent always *has* been followed by the consequent, but that as long as the present constitution of things

endures it always *will* be so. And this would not be true of day and night. We do not believe that night will be followed by day under all imaginable circumstances, but only that it will be so *provided* the sun rises above the horizon. If the sun ceased to rise, which, for aught we know, may be perfectly compatible with the general laws of matter, night would be, or might be, eternal. On the other hand, if the sun is above the horizon, his light not extinct, and no opaque body between us and him, we believe firmly that unless a change takes place in the properties of matter, this combination of antecedents will be followed by the consequent day. . . . Invariable sequence, therefore, is not synonymous with causation, unless the sequence, besides being invariable, is unconditional. There are sequences, as uniform in past experience as any others whatever, which yet we do not regard as cases of causation, but as conjunctions in some sort accidental. Such, to an accurate thinker, is that of day and night. The one might have existed for any length of time, and the other not have followed the sooner for its existence; it follows only if certain other antecedents exist; and where those antecedents existed, it would follow in any case. No one, probably, ever called night the cause of day; mankind must so soon have arrived at the very obvious generalisation, that the state of general illumination which we call day would follow from the presence of a sufficiently luminous body, whether darkness had preceded or not. We may define, therefore, the cause of a phenomenon to be the antecedent, or the concurrence of antecedents, on which it is invariably and *unconditionally* consequent."¹

With reference to this we have to make the following inquiries. First, what possible warrant have we for introducing the idea of unconditionality or necessity into the

¹ Bk. III. ch. v. § 6.

definition of cause, when it has already been stated that the idea of causation is based only on experience of succession? Secondly, if this idea is legitimately introduced, as a product of experience, how are we to account for its absence from our conception of the relation between night and day? Or thirdly, if in fact it is not absent from this conception, why do we still not call night the cause of day?

1. We find what is practically Mill's answer to the first question in a foot-note appended to a subsequent chapter. "Dr. Ward's last, and, as he says, strongest argument, is the familiar one of Reid, Stewart, and their followers—that whatever knowledge experience gives us of the past and present, it gives us none of the future. I confess that I see no force whatever in this argument. Wherein does a future fact differ from a present or a past fact, except in their merely momentary relation to the human beings at present in existence? The answer made by Priestley, in his examination of Reid, seems to me sufficient, viz., that though we have had no experience of what *is* future, we have had abundant experience of what *was* future. The 'leap in the dark' (as Professor Bain calls it) from the past to the future is exactly as much in the dark, and no more, as the leap from a past which we have personally observed to a past which we have not. I agree with Mr. Bain in the opinion that the resemblance of what we have not experienced to what we have, is, by a law of our nature, presumed through the mere energy of the idea, before experience has proved it."¹ Let us examine the value of this reply.

He seems to contend, that experience of the past both warrants and contains assurance that what has invariably been will still continue to be. In the first place, he seems to say, experience warrants the assurance, because we find, on looking back to many a past date, that what had

¹ Bk. III. ch. xxi., foot-note.

invariably been before that date did, in fact, continue to be after it, though at the time we had no certain knowledge that it would do so. Hence we may legitimately conclude, that what has invariably been up to the present time will continue to be in the future, though otherwise we have no certain knowledge of this. And in the second place, he seems to say, existing experience itself contains this assurance, though subsequent experience is needed to really prove the fact. His first contention appears to be, that a given relation between two phenomena may be confidently looked for in the future, because the continuity of this relation is seen to have remained unbroken in the past. His second appears to be, that a given relation may be looked for, because the relation itself is seen to have invariably existed in the past. In the first he seems to regard the mind as following, in some degree, the manifestations of an antecedent throughout their course, and discovering no instance of its being succeeded by another consequent. In the second he seems to regard it as simply knowing of no consequent but one. The two contentions agree in the point that the mind has legitimate ground for looking in future for the consequent to which it has become accustomed. But otherwise they appear to be inconsistent with each other; and we had better treat them as if they were presented as alternatives.

With regard to the first, it is no doubt true that there are cases in which the uninterrupted occurrence of any given phenomenon or combination of phenomena gives rise to a conviction that the occurrence will continue in the future. Such cases we shall have to notice in a later chapter of this treatise. It may here be said of them that the principle which they exemplify is something quite different from the uniform relation between cause and effect. To expect A, or B, or A and B, to go on happening from time to time in the

manner that they do, because they have never yet been known to happen otherwise or to cease to happen, is a very different thing from expecting that, whenever A happens, B will happen in succession to it. That an idea of certainty or necessity should be born of experience of the continuous manifestations of phenomena is no ground whatever for introducing the same idea into experience of the happening of one phenomenon being uniformly followed by the happening of another. It must altogether be denied that it is admissible to transfer the idea of certainty or necessity from the absolute continuity of a phenomenon, or of a collection or succession of phenomena, to the contingent continuity of a relation of succession between one phenomenon and another. Further, even if we could transfer it, its existence would first need to be accounted for.

And with regard to the second contention, it is no doubt true that there are cases in which experience of an invariable relation of succession between one phenomenon and another leads to expectation that the relation will continue. But then, it is here maintained, this is because, together with experience, there is present in the mind another conception which makes it possible for experience to be utilised. The question, be it observed, is just that which has recently been spoken of as a crucial question of a theory of inference. It is contended, that thus to found expectation of the future upon experience of the past is a mode of generalising, a genuine act of inference, which is only possible because the mind is in possession of a conception of causation undervived from uniform experience. It cannot for a moment be allowed, that there is in experience itself any kind or degree of knowledge concerning anything except that which is already past.

2. But supposing Mill to have silenced our questionings as to the unconditionality or necessity of one phenomenon,

whenever it may happen, being succeeded by another ; so that we cease to dispute the possibility of the idea being contained in or evolved from the simple experience of the past ; supposing this, we have still to confront him with the following dilemma. Since day has invariably succeeded night, and yet we do not call night the cause of day, either invariableness of succession does not, as a matter of fact, give rise to the idea of unconditionality, or unconditional invariableness of succession does not constitute what we understand by causation. For one reason or the other (if not, as we must maintain, for both) invariableness of succession does not, in this particular case, give rise to the notion of causation. If the former alternative be chosen, then his view of causation is such as to be useless for the purposes of a theory of inference ; if the latter, then his view needs to be entirely reconsidered.

Mill does not shrink from encountering this objection. He holds that in the special case of the succession of night and day invariableness does not give rise to the idea of unconditionality, but that this peculiarity may be accounted for consistently with the maintenance of his theory of causation. In addition to his remarks upon the subject in the passage already quoted, he writes as follows :—"To some it may appear, that the sequence between night and day being invariable in our experience, we have as much ground in this case as experience can give in any case for recognising the two phenomena as cause and effect ; and to say that more is necessary—to require a belief that the succession is unconditional, or, in other words, that it would be invariable under all changes of circumstances—is to acknowledge in causation an element of belief not derived from experience. The answer to this is, that it is experience itself which teaches us that one uniformity of sequence is conditional and another unconditional. When we judge

that the succession of night and day is a derivative sequence, depending on something else, we proceed on grounds of experience. It is the evidence of experience which convinces us that day could equally exist without being followed by night, and that night could equally exist without being followed by day. To say that these beliefs are "not generated by our mere observation of sequence," is to forget that twice in every twenty-four hours, when the sky is clear, we have an *experimentum crucis* that the cause of day is the sun. We have an experimental knowledge of the sun which justifies us on experimental grounds in concluding, that if the sun were always above the horizon there would be day, though there had been no night, and that if the sun were always below the horizon there would be night, though there had been no day. We thus know from experience that the succession of night and day is not unconditional. Let me add, that the antecedent, which is only conditionally invariable, is not the invariable antecedent. Though a fact may, in experience, have always been followed by another fact, yet if the remainder of our experience teaches us that it might not always be so followed, or if the experience itself is such as leaves room for a possibility that the known cases may not correctly represent all possible cases, the hitherto invariable antecedent is not accounted the cause; but why? Because we are not sure that it *is* the invariable antecedent."¹

Now what does this argument amount to? Experience, it says, teaches us that the sun, rather than night, is the unconditional invariable antecedent, or cause, of day. But how can this circumstance, obviously inconsistent with the position that presumption or expectation is born of invariable experience, possibly explain the failure of expectation to be in this case born? How can an exception to the law of

¹ Bk. III. ch. v. § 6.

nature, that experience of a uniform past involves assurance of a uniform future, explain itself, leaving the law substantially intact? It must be pointed out, that the experience which discriminates between the sun and night, as the cause of day, can, apparently, be no other than the experience of a mind already possessed of an idea of causation as something more than a relation of succession. But if we waive this difficulty—a difficulty perhaps sufficient in itself to upset Mill's theory—and assume that a mind, knowing only of a relation of succession, can distinguish between an invariable succession that is conditional, and an invariable succession that is unconditional, how does its refusing to see in the sequence of night and day the quality of unconditionality release this pair of phenomena from the operation of the other mental process which pronounces that the quality must be present? It appears to be simply a case of contradiction, a case of one kind of experience refuting the alleged teaching of another kind. To say that expectation of the future is naturally engendered by uniform experience of the past, and then to excuse a manifest exception to this alleged fundamental principle by the plea, that it is by a discriminating experience that the exception is demanded, appears to be no sound defence whatever of the principle in question. The principle, having an exception, must be abandoned as a principle.

We may now, perhaps, look upon Mill's doctrine of causation—that it is a conception which, being the basis of inference, is one of observed and yet unconditional succession—as sufficiently refuted. The three terms—basis of inference, product of experience, unconditionality of sequence—cannot possibly be harmonised into one conception. A conception of causation derived from experience, and existing prior to all inference, cannot possibly comprise any reference to the future: a conception of unconditional sequence, forming the

basis of inference, cannot possibly be derived only from experience: a conception of the future, inferred from the experience of the past, cannot possibly be the basis of all inference.

Let us, then, consider it sufficiently established, that a cause is an antecedent phenomenon from which the effect is considered to proceed, and that this procession, being conceived of as in accordance with the orderly design of nature, presents itself to the mind as necessary or unconditional. Investigation of Mill's argument on the question of universality as appertaining to causation must be postponed until we have discussed the processes of induction and deduction.

IV. We may now take up the question of the discrepancy between Mill's view and ours as to what the uniformity of causation properly consists in. A cause, he says, is invariably followed by the same effect, but an effect is not invariably preceded by the same cause. "It is not true, then, that one effect must be connected with only one cause, or assemblage of conditions; that each phenomenon can be produced only in one way. There are often several independent modes in which the same phenomenon could have originated. One fact may be the consequent in several invariable sequences; it may follow, with equal uniformity, any one of several antecedents, or collections of antecedents. Many causes may produce mechanical motion: many causes may produce some kinds of sensation: many causes may produce death. A given effect may really be produced by a certain cause, and yet be perfectly capable of being produced without it."¹

In writing thus he certainly appears to be in error. There seems to be no sound reason for assigning less uniformity to the cause which produces a given effect, than to the effect which proceeds from a given cause. Doubtless it is a fact that mere experience fails to show that similar effects are in

¹ Bk. III. ch. x. § 1.

all cases the results of similar causes. But no less is it a fact that mere experience fails to show that similar causes in all cases give rise to similar effects. If in truth our apprehension of uniformity, even in relation to things that happen before our eyes, were derived only from experience, it would surely be, as regards the effects of causes no less than the causes of effects, an apprehension consistent with the recognition of manifold exceptions. Mill himself writes thus: "All laws of causation are liable to be in this manner counteracted, and seemingly frustrated, by coming into conflict with other laws, the separate result of which is opposite to theirs, or more or less inconsistent with it. And hence, with almost every law, many instances in which it really is entirely fulfilled do not, at first sight, appear to be cases of its operation at all."¹ He proceeds to explain that the cause must be held to be acting normally, even though the effect is not visible to the senses: it is followed by a tendency to something, even though the tendency is prevented from being realised. "All laws of causation, in consequence of their liability to be counteracted, require to be stated in words affirmative of tendencies only, and not of actual results."¹

If it is a reasonable explanation of the failure of a cause to produce always the same apparent effect, to say that the tendency to this effect has been neutralised or concealed by the action of some other cause, why may not the circumstance of an effect not proceeding always from the same apparent cause be somewhat similarly accounted for? Why may it not be said that the true and only cause of a particular single effect exists in combination with other causes among which it is concealed? Death, for example, is produced, so far as simple experience teaches, by various causes; but at the same time the death which proceeds from one kind of cause is not in all respects precisely the

¹ Bk. III. ch. x. §5.

same phenomenon as the death which proceeds from another kind. Death is, in each instance of it, a compound effect. And why may we not hold that the element, which the various manifestations of death have in common, has its own particular corresponding element in each of the various kinds of compound cause?

Of course, to take this view and under all circumstances to maintain it, is to pass beyond the limits of mere experience and observation. But so also must we sometimes pass beyond these limits, in order to maintain the view that, even in relation to matters which come under our notice, similar causes are invariably followed by similar effects. And consequently, Mill's theory of causation—in insisting that experience is the basis of the conception, in going outside experience to justify the assertion that a cause is invariably followed by its own consequent, and in refusing to recognise, on the ground of its not being consonant with experience, the correlative truth that an effect is invariably preceded by its own antecedent—appears to involve, here as elsewhere, inconsistency or contradiction.

CHAPTER III.

INFERENCE.

I. IT appears to be a main part of the proper business of the mind to make itself acquainted with the world in which it has existence. Facts and occurrences outside itself, and the relations in which phenomena stand to one another are, in its regard, natural and proper objects of attention and inquiry.

Besides the knowledge which it attains by means of observation, and of subsequent reflection on the things observed, there is a knowledge of which it becomes possessed by means of a special kind of movement. This movement has its starting-point only in things observed; its goal lies in some new object found to satisfy certain conditions of relation between itself and the things already in a manner known. And this movement is what we call an act of inference. It is a passage from the known to the unknown, made in the light of certain conditions that have to be fulfilled. It is the discovery of some new object, knowledge of which is felt to be needed to amplify and complete our knowledge of objects already partially revealed. It is the fastening upon some new object, with which the old ones are perceived to be indissolubly connected. It is an activity to which the mind is urged by its own inherent curiosity, as well as by consideration of the practical benefits of extending knowledge beyond the limits of experience and immediate observation.

The principle of causation has been represented in the preceding chapters as the essential basis of an act of inference. And it is for the following reason that it is thus spoken of. Principles closely bound up with the principle of causation are essential means to the mind's making the passage from the known to the unknown. They are the conditions of relation between the new and the old, which the mind recognises as having to be fulfilled. And further, an act of inference is for the most part connected in a more direct manner with the principle of causation. For it is, in the vast majority of cases, the making discovery of the cause of a given effect or of the effect of a given cause.

By way of illustrating to ourselves the position that inference is the discovery of causes and effects, we may take a few simple statements of inferred fact, and see how they really express a relation of causation between two phenomena.

(1.) Let the statement be—I travelled with a person yesterday, whom I knew, from his emaciated appearance, to be very ill. Here the inference conveyed is, that the emaciated appearance of a certain person was an effect which had grave illness as its cause. (2.) The inference—You must be hungry, as you have had nothing to eat for some hours—might be expressed thus: In any person—and the expression 'any person' includes you—want of food such as you have now experienced is a natural cause of a feeling of hunger. (3.) The following sentence—I have just learned from the newspaper, that there was an eclipse of the sun yesterday visible in America—is an instance of inference from testimony. Its meaning is, I see in the actual fact of an eclipse having taken place an essential part of the cause of its being reported in the newspaper that it did take place. (4.) The inference—It is evident from his successful campaigns, that Napoleon was an extremely able general—

is equivalent to the statement, Great strategic ability in Napoleon is an explanatory cause of the success which attended his campaigns. (5.) The inference expressed in the words—If it is fine to-morrow evening, there will be light enough for walking home, as the moon will have risen and will be full—is an inference that light is a natural effect of any instance of a shining full moon.

The example last given leads to notice of the comparatively limited class of inferences which do not express a relation between cause and effect. If the sentence ran thus—When we walk home to-morrow evening, the moon will have risen and will be full—there would be an implied inference which is not, or at all events need not be, an inference from cause to effect or from effect to cause. The rising and the fulness of the moon are the facts inferred. And the inference is not, at all events in the case of uneducated people, that these will be the certain effects of causes known to be in operation. It is, that these phenomena will certainly take place to-morrow evening, since the time of their regular recurrence will have arrived. It is unnecessary at present to say more in this connection.

II. All inferred statements are capable of being concisely expressed in the form, A is a fact, therefore B is a fact. And this may be regarded as their typical form of expression. If the inference is from effect to cause, the word 'therefore' introduces the conclusion, as that which the mind has now discovered. If the inference is from cause to effect, it serves to introduce the effect itself, as well as the mind's discovery of the effect. In the former case we have a sentence like the following: His appearance was emaciated, therefore he was very ill. By which conclusion is meant, Therefore I knew him to be very ill. In the latter case we have a sentence such as this: You have been long without food, therefore you are hungry. Which conclusion covers

the two meanings, Therefore I know that you are hungry, and, You are hungry in consequence of your long fast.

But we must be on our guard against mistaking every operation of the mind, the conclusion of which may be introduced by the word 'therefore,' for an act of inference. There are many instances in which there is no semblance of a movement from the known to the unknown. If we say, for example, Four is the double of two, therefore two is the half of four; or, A window is a pane of glass framed in a wall, therefore this pane of glass framed in a wall is a window; or, Two straight lines cannot enclose a space, therefore AB and AC cannot enclose a space; we seem, in these cases, to have no more than a dealing by the mind with knowledge of which it is already in possession.

There are, however, other instances, in which the mind may appear at first sight to move onwards from the known to the unknown, and yet not in dependence upon the principle of causation. This appearance is misleading. If the supposed movement is not in fact made in dependence upon this principle, it is not made at all. The following is, perhaps, a case in point. A person says, we may suppose, This fruit is a ripe orange, therefore it has juice inside. And it may seem that in saying this he is making a genuine act of inference without any regard to causes and effects. But it must be objected that, either there is here no movement from the known to the unknown, or there is a movement dependent upon the principle of causation. Is a ripe orange a fruit which presents externally certain marks by which it is known? or is internal juiciness a material part of the conception? If the former is the case, it must be maintained that if the mind passes on to the knowledge of the new fact, that there is juice inside, it can only be in dependence upon the principle of causation. But if the latter, then there is no proper movement of the mind from the known to the

unknown; for, until the juice is discovered, it does not really know that the fruit is a ripe orange. The argument expresses no more than a tentative movement, resulting in the probable conclusion that the fruit, being in appearance what it is, is a ripe orange, and, as such, has juice inside.

III. Of inference there appear to be four different kinds. That is to say, there are four different ways by which the mind, starting from the known, may reach, in dependence upon the principle of causation, the hitherto unknown. The four kinds or ways may be named induction, deduction, illation, and delation. The last term, it must be explained, is not known as a word expressing inference. It is introduced here on account of its form, which seems to mark it as a word that may be fitly used, in the absence of a better, to signify a kind of inference which is connected with illation in much the same way as deduction with induction, and differs from deduction in much the same way as illation from induction. The first three kinds of inference consist in the discovery of the causes of effects and effects of causes.

Induction and deduction—as the terms are here employed—are in strict dependence upon that principle, closely bound up with the principle of causation, which we have already discussed as the principal of uniformity in nature. Illation and delation are in strict dependence upon another principle, also closely bound up with that of causation, hereafter to be discussed as the principle of continuity in nature.

For the present we may dismiss from further consideration the two last-mentioned kinds of inference, and concentrate our attention upon induction and deduction. It may sometimes be convenient to think and speak of these two under one common name; and ‘logical inference’ seems a fairly suitable name by which to call them. In one respect the term seems satisfactory, since it is likely to suggest to the general reader inference of a formal and demonstrable

character. In one respect it seems unsatisfactory, since writers on logic are not agreed as to what constitutes the real province of logical science. If we elect to include in logic, besides deduction, induction understood to be based upon the principle of uniformity in nature, we shall be in substantial accord with Mill; seriously differing from him, however, in holding that there are two valid kinds of inference lying outside the domain of logic.

It may lastly be remarked that, philosophically, the order in which the two kinds of logical inference have been mentioned should be reversed; since, as we shall see, an act of deduction appears to be precedent to the completion of every induction. But, inasmuch as most deductive inferences are subsequent to those of induction, it seems on the whole convenient to treat of induction before deduction; and the order of naming them has been determined accordingly.

IV. Before proceeding to consider the process of discovering causes and effects by the method of induction, let us take the preliminary step of realising clearly what it is that the mind, when at any time it begins to infer, is seeking to discover. What is about to be said, though said with special reference to induction, is mostly applicable to illation also.

It has already been pointed out that every phenomenon, regarded as an effect, has, not one cause, but an ancestry of causes; and that every phenomenon, regarded as a cause, has, not one effect, but a posterity of effects. Even if every effect that we notice was a single effect, produced by only one immediate cause, this cause being in turn the effect of a cause behind it, we should still have a chain of causes, or line of ancestry, reaching from the effect to the primeval cause; any cause whatever in this chain being in a true sense a cause of the effect in question. Any cause in the chain is a cause from which the effect ultimately proceeds,

and without which it could not possibly have existence. And similarly, if every cause that we notice was a single cause, producing immediately only one effect, this effect being in turn the cause of another succeeding to it, we should still have a number of effects, each of which is in a true sense an effect of the cause in question.

But the truth, that for every effect there is a multiplicity of causes and for every cause a multiplicity of effects, becomes much more conspicuously evident when we consider how, in fact, causes join with other causes to produce effects, and several distinct effects are at once the products of the same causes. For example, manual labour and showers of rain join with other causes to produce good crops; while both manual labour and showers of rain have in their turn proceeded each from some combination of causes. So again, manual labour and showers of rain, besides contributing together to the growth of crops, have their quite separate influence upon the life of the agriculturist, being thus in various ways factors in the production of a number of subsequent effects not otherwise connected with each other. Thus every ordinary effect, being a compound effect, has—exactly in the same way, it would seem, as living creatures have—a spreading ancestry behind it, every individual member of which has been essential to its production. And similarly every ordinary cause, being a compound cause, has a widening posterity succeeding to it, every individual member of which owes its existence in some measure to this cause.

This being so, when the mind inquires the cause of a given effect or the effect of a given cause, what it is seeking to discover is really no more than a very small part of the history of the phenomenon under consideration. Some one link in a chain of causes joining the phenomenon in some direction to the distant past, or in a chain of effects leading

in some direction to the distant future, is for the most part all that it aims at ascertaining at any given time.

And yet the mind, in endeavouring to unite the phenomenon which excites its curiosity to some one other as its cause, or to some one other as its effect, must not be regarded as indifferent as to where, or of what sort, the cause or the effect shall be. It is searching for information which it can understand, for information which can be felt by it really to advance its acquaintance with the world around it. It looks for a cause which shall answer more or less plainly to its notion of a cause as giving birth to the effect, or for an effect which it can in some measure realise as proceeding from the cause. It asks for a cause so nearly related to the effect, or for an effect so nearly related to the cause, in respect of apparent kinship or of proximity of time or place, that some approach to a vivid apprehension of the relation of causation between them may be possible. Of no other does it, in ordinary circumstances, much care to know.

CHAPTER IV.

INDUCTION.

I. UNDERSTANDING that the mind commonly looks for one cause or one effect at a time, and that the cause or effect looked for is one which, by reason of some kind of nearness to the effect or cause, shall seem to be intelligible, we proceed to consider the process of inferring causes and effects by the method of induction. The essence of the method may be said to consist in a work of comparison and contrast. The phenomenon whose cause or whose effect we are seeking to discover is regarded as being, in every instance of it, contained in or surrounded by a set of circumstances among which the cause or the effect must lie. Taking then some instance of the phenomenon, and neglecting all those of its surrounding circumstances among which we have no interest in finding a cause or an effect, we have remaining a certain limited range of circumstances within which our investigation is to be carried on. The circumstances, other than the phenomenon itself, within this range are such as have preceded it, if we are looking for a cause, and such as have succeeded it, if we are looking for an effect. We next bring under observation other sets of circumstances preceding or succeeding instances of the phenomenon, and we ascertain which of the circumstances are common to all the sets, including the first. Or we bring under observation other sets of circumstances bearing

a general resemblance to the set before us, but known not to have after them or to have had before them an instance of the phenomenon, and we ascertain which of the circumstances in the given set are present in any one of these sets. In the one case, we compare our first set with others, in order to ascertain what it has in common with them all, and what it has that is not common to them all. In the other case, we contrast it with others, in order to ascertain what it has in common with any one, and what is therefore left to it that is absent from them all. In the one case, we judge that the cause or the effect is contained somewhere among the common circumstances, the remainder being with certainty disregarded. In the other case, we judge that it is contained somewhere among the circumstances which are found in the first set only, those which are common to it and any other set being certainly such as may be set aside. The one form of the method may be spoken of as the method of comparison, the other as the method of contrast. The two may often be employed in connection with the same inquiry.

To illustrate roughly what has just been said, let us suppose it to be required to find the cause of good health. We might take some person in good health, and turn our attention to such of his personal habits as seemed at all likely to have a bearing upon health. We might then take a number of other persons whose health is good, and ascertain, by striking out from the list of habits we have drawn up every one which any individual among these persons is found not to practise, which of the habits of the first person are common to them all. These we should judge to contain collectively the required cause. Or we might contrast the habits of the first person with those of a number of persons not in the enjoyment of sound health, and ascertain, by striking out every habit which

any one of them has in common with himself, by which of his habits it is that he is distinguished from all of them. Among these we should judge the required cause to lie. Both forms of the method would be made use of, if we were first to find habits common to the observed healthy persons, and then eliminate some of these as being shared also by persons not in good health.

It must here be explained, that in the examples of induction given in this chapter no attempt is made to trace particular causes and particular effects with scientific accuracy. To make such an attempt would be to enhance largely and unnecessarily the difficulty of the discussion both for author and for reader. It would enhance it largely, because the complexity of causes and effects as they appear in nature is so great—cause combining with cause and effect with effect—that in almost every phenomenon there is an assemblage of causes producing an assemblage of effects, or an assemblage of effects proceeding from an assemblage of causes. And to single out a quite definite effect or cause, and follow it correctly to some definite factor of a compound cause or effect, is mostly a special work requiring careful and patient labour. The attempt to do this, moreover, is here quite unnecessary, since the subject of our investigation is the science of inference only, not any of the other sciences in which inference is employed. How the mind deals, not with certain particular facts, but with any facts, is what we are here concerned to know. All, then, that is aimed at is to state accurately the method of the mind's procedure, and to adduce such rough and popular illustrations as may suffice to make the statement clear.

II. Among the earliest and simplest conclusions, in arriving at which induction is employed, are general conclusions such as, Any nest is built by a bird, Any bird builds a nest. These conclusions may be incorrect relatively to the whole

of the facts of nature, and yet may be perfectly sound as the tentative and immature conclusions of a person under whose notice only a limited number of facts has come. They have the same interest for the purposes of this discussion as conclusions of the most unimpeachable correctness. For our main business is to see what is the natural action of the mind in making inferences. How far its operations can be relied upon as leading to objective truth will to some extent appear as we proceed.

If the mind, having observed several instances of a nest, proceeds to investigate—it may be almost unconsciously—the cause, it apparently reasons substantially as follows:—(1.) Each nest being built by a bird, there must be in or connected with the bird the cause of its being built. (2.) The effects being similar, the causes must be similar. (3.) The common cause is to be found in those antecedent circumstances which are common to all the birds whose nests have been observed. (4.) The common circumstances appear to be comprised in the bird-nature which is common to them all. (5.) Since each of the observed nests has its cause in the nature of a bird, any other nest, being an effect similar to it, likewise has its cause in the nature of a bird.

Or if a number of birds—whose bird-nature constitutes a set of causes common to them all—are watched, and the mind seeks to discover something which as birds they do, the reasoning is, apparently, of a very similar character. (1.) The nature of each bird is a cause leading to its doing something. (2.) There being a cause common to them all, there must be a corresponding effect common to them all. (3.) The common effect is to be found in something which all are observed to do. (4.) Such a common effect is the building of a nest. (5.) Nest-building, being an attribute of each bird brought under observation, is an attribute of any creature of like nature, that is, of any bird.

Let us now, before discussing this analysis, pass on to consider a very simple case of inferring by induction a more particular cause of a given effect, or a more particular effect of a given cause. Let us take the case of a boy learning by experience to associate together industry and a master's favour and regard. Expressions of his master's good-will, he comes to know, have their cause in his industry ; or he gradually perceives that his industry produces as its effect these expressions.

The course of reasoning may be as follows :—(1.) Expressions of good-will, noticed from time to time, have their causes. (2.) So far as they are in character the same, their causes must be the same. (3.) A similar or common cause must be found in the sets of circumstances which precede and are in some connection with them. (4.) Such a cause is my industry. Or the argument may run thus :—(1.) My industry produces some effect. (2.) So far as it is day by day the same, the effect must naturally be the same. (3.) The uniform effect lies in circumstances connected with the master's examination of the work done. (4.) Such an effect are his expressions of approval.

The method of contrast, it may be pointed out, may also be supposed to be employed in such a case as this ; and we may alter the above chains of reasoning accordingly. In finding the cause we shall now have this argument :—(1.) Expressions of good-will have a cause. (2.) This cause cannot be present when the expressions are absent. (3.) The cause must be found among circumstances of my conduct which are present when the expressions are present, and absent in their absence. (4.) Such a cause is my industry. And in finding the effect the mind will argue thus :—(1.) My industry produces some effect. (2.) The effect, whatever it is, must be absent whenever the cause is absent. (3.) It must be found among some circumstances

of my school life which follow industry, but do not follow idleness. (4.) Such an effect are my master's expressions of approval.

The employment of the method of contrast belongs, perhaps, to a later period of the mind's development than the employment of the method of comparison. And it would seem to depend a great deal upon the circumstances of any given case whether, and how far, the mind makes use of it in addition to, or instead of, the earlier method.

III. The above analysis of the process of discovering by induction causes and effects indicates several distinct steps. First, if this may be called a step, the mind takes up the conception of causation and prepares to look for a cause or for an effect. Secondly, it brings together a number of sets of circumstances each containing an instance of the effect or cause, or a number of sets not containing an instance, but otherwise bearing some resemblance to sets containing it. Thirdly, it makes a deductive inference, saying that the looked-for cause or effect must be present in every one of the first named sets, or that it must be absent from every one of the last named sets. Fourthly, it searches among the sets for an antecedent or a consequent, in some sort of proximity to the effect or cause, fulfilling the condition. Fifthly, having found one, it pronounces—more or less confidently and more or less correctly—that it is the required cause or effect.

In the case of an act of generalisation there is yet a sixth step. There is a second act of deductive inference, in which the mind pronounces that the cause of the observed effect, or the effect of the observed cause, is a type-cause of all similar effects, or a type-effect of all similar causes.

The first deductive inference—which is always made—and the second—which is made whenever the mind passes from the facts before it to others like them—are, be it

observed, made in dependence upon or in accordance with the principle of uniformity in nature. So soon as the mind has before it similar effects or similar causes, it knows from memory, or at the moment realises, that they proceed from some similar or common cause, or give rise to some similar or common effect. It likewise knows, it may be added, by means of an act of reflection, that the cause or the effect cannot be present in a set of circumstances from which the effect or the cause is absent.

Mill, it may now be remarked, regards the whole movement of the mind, in its passage from particular facts to a general proposition grounded on these facts, as consisting of but one operation; and this he speaks of as induction. His view will presently be commented on. What is here meant by induction is only that part of the mind's movement which it makes when, carrying with it the conception of causation, it searches for and lights upon, within a certain limited range, some particular circumstance or group of circumstances antecedent to an effect or subsequent to a cause; the circumstance or group of circumstances being common to all sets containing a similar effect or cause, or absent from all sets not containing an instance of it. It is the simple work of comparison or contrast engaged in, and consummated, for the purpose of tracing, in the light of the principle of uniformity in nature, a cause or an effect.

IV. The method, which has been represented as followed by an immature mind more or less unconsciously, is substantially that which a trained intelligence consciously and deliberately adopts. A trained intelligence adopts it, not merely for the sake of acquiring additional knowledge of the ways of nature, but also for the sake of turning acquired knowledge to practical account. It seeks to ascertain the cause of an effect or the effect of a cause, not merely that it may the better understand the world in which it lives, but

also that it may learn how causes can be directed and controlled, to the furtherance of effects that are beneficial and the hindrance of such as are injurious. Let us now take a case of deliberate search for the cause of an effect.

Let it be required to find the cause of a certain person exhibiting symptoms of being poisoned. If it should be found that other persons are suffering with like symptoms, we may make use, or begin by making use, of the method of comparison. If there is no other, the method of contrast must be employed. We are looking, be it remembered, not for the recondite immediate cause, the discovery of which is a matter for physiological science; nor for any very distant cause, such as the original production of the poison; nor for any merely modifying or contributory cause, such as the constitution of the patient, by which the effect of the poison is in some degree determined. But we wish to find a cause which shall not be so remote from familiar occurrences of daily life, or so apparently unconnected with the effect, as to fail to be explanatory. We wish to find the cause among circumstances which we have opportunity of bringing satisfactorily under observation, and which stand in some kind of recognised proximity to the effect. The eating of some special article of food, for example, would be a cause of the kind required.

Taking the case in which there are a number of persons suffering together, we bring under observation the several sets of circumstances which constitute the lives, antecedent to the event, of the several patients; dismissing as irrelevant all circumstances that are inaccessible to the unscientific observer, and all that appear to be remote from the effect, and being especially careful to keep in view all that are connected with the patients' dietary. Among the reduced sets before us, and especially among those parts of them which have to do with diet, we make search for circum-

stances common to the lives of all; and among these common circumstances, when they are found, we judge the common cause to lie. If the cases which come under observation are fairly numerous, and their circumstances various, the common circumstances will be few; so that the cause may be looked upon as almost found. Otherwise their number may be lessened by now introducing the method of contrast. All the common circumstances, which are found in the case of any person who is not a sufferer, may be eliminated.

All has now been done towards the discovery of the cause that induction can do. Unless there is but one antecedent left, or unless we can learn by experiment, or by the evidence of other facts, that it is in this one, and not in that, of the group of residual antecedents that the cause lies, we must be satisfied with having nearly, but not quite, discovered its location.

But it must now be pointed out that—apart from experiment or other evidence—the certainty of a cause being contained in the small set of residual antecedents depends upon two things. It depends not only upon the accuracy of our work of comparison and contrast, but also upon our not having unduly restricted the range of investigation. We propose to ourselves to find in some article of food the cause of symptoms of being poisoned. But it may very well be that the explanatory cause really lies elsewhere, and possibly among circumstances which we have overlooked. It is conceivable that we might in some particular case, unless we were extremely careful, dismiss at the outset every one of the causes among the circumstances deemed irrelevant. Only, perhaps, if it were possible for all or nearly all the antecedents, which for the attainment of any practical result it is necessary to get rid of, to be eliminated by systematic and accurate comparison and

contrast, could it be properly affirmed that the residuum infallibly contains a cause.

The method of ascertaining the effects of causes is similar to that whereby the causes of effects are made known. Let the subject of inquiry be, for example, the special effect of military training upon young men. We should proceed, by means of a comparison of all soldiers who come under our observation, to take note of certain salient points of character and conduct that appear to be common to them all. We should then, by contrasting them with persons who have not received a military training, discover that, while some of the common points are to be met with elsewhere, yet there are one or more among them which seem to be peculiar to the military calling. Thus we may suppose that all soldiers are found, by the method of comparison, to be loyal and patriotic, to have a keen sense of comradeship, to be indifferent to danger, to be prompt in obeying orders, to have an erect carriage and precise deportment. And we may suppose it to be found, by the method of contrast, that of these characteristics only one, namely, the last, is peculiar to the soldier; since there are evidently large numbers of persons possessing one or more of the others, while sailors may be held to possess them all. We should then conclude that an erect carriage and precise deportment is the one noticeable result of military discipline as distinguished from all other kinds of training.

V. The results of this discussion may now be recapitulated before we pass on to the subject of deduction.

The method of induction is the mind's method of approaching the discovery of causes and effects, by gradually contracting within very close limits the area or range of circumstances in which it has purposed to seek for a cause or an effect. And induction, or inductive inference, is the mind's discovery, with the aid of deduction, that a cause

or an effect lies, so to speak, somewhere within a certain very narrow space. The contraction is accomplished by excluding or eliminating from the selected body of circumstances, antecedent to the effect or subsequent to the cause, all those which are not found in every other instance in which the effect, or the cause, is observed to be present, and likewise all which are found in any one instance in which the effect, or the cause, is observed to be absent. This exclusion or elimination is justified by the principle of uniformity in nature. Upon the number and variety of the sets of circumstances with which the first set is compared and contrasted will, in general, depend the completeness of this process of eliminating the circumstances in which a cause, or an effect, cannot possibly reside.

When the process of elimination has been carried correctly as far as we can carry it, we have before us one of three cases. Either (1) no circumstance remains, in which case it follows that the presumption of a cause or an effect being contained in the selected body was a mistaken presumption; and we must begin our search anew among some other body. Or (2) one circumstance remains, in which case, in so far as cause or effect is presumably contained somewhere in the selected body, this presumably is a cause or an effect. Or (3) several circumstances remain, in which case, unless some independent evidence can be adduced, connecting one of them rather than another with the phenomenon whose cause or effect we are seeking to discover, we must stop short of full discovery. We must be content to know that, in so far as cause or effect is presumably contained somewhere in the selected body, there is presumably in the small residue before us a cause or an effect.

Induction can, in general, do no more than show us a small number of circumstances among which presumably

the cause or the effect must lie. Evidence of a different kind from that afforded by other instances of the presence, or instances of the absence, of a given phenomenon is commonly required in order, not only that we may lay our hands with certainty upon a cause or an effect, but also that we may learn with certainty within what narrow space it lies concealed. Induction cannot, in general, give complete assurance, even that the locality of the cause or effect has been discovered. Only in the cases, if any such there can be, in which it might be possible to say with certainty, not only that all the real causes or effects had not been rejected as circumstances irrelevant to the inquiry—so that the residue would contain at least one—but also that all the really irrelevant circumstances had been rejected or eliminated—so that the residue would contain none that are irrelevant—would it be possible to say with certainty that the cause or effect had been discovered by the process of induction only. In such cases every one of the residual circumstances would be a cause, or an effect.

CHAPTER V.

DEDUCTION.

I. IN dealing with induction we have had occasion to notice two acts of deductive inference; the one being an essential aid to the process of induction, the other transforming the conclusion into a law of nature. The one declares that if X represents the unknown cause or effect of the observed phenomenon, X likewise represents the cause or the effect of every other instance of the phenomenon: it declares also, if need be, that in the absence of an instance, X must be absent also. This is a recognition of the uniformity that exists in nature. The other deduction is supposed in the illustration given to pronounce as follows. From the induction, that all observed nest-building is done by birds, it draws the conclusion, that any nest is built by a bird. And from the induction, that all observed birds build nests, it draws the conclusion, that any bird builds a nest.

These acts of deductive generalisation, to us obviously erroneous, are natural to a person of limited experience. It is concluded in the one case, that the faculty of nest-building exists only, and in the other case, that it exists always, in the nature of a bird. If we take A to represent this faculty, B the remainder of the nature of a bird, and P a nest, we have, as the results of our inductions, (1) P in each observed case has its cause in AB, (2) AB in each observed case produces P. From (1) we may make the

deductive inference, Any P has its cause in either A or B; but obviously not—as in the example given—Any P has its cause in AB. For if A is the actual cause, P might be produced by AC or AD; it being possible, as we now know or consider, for A to enter into other combinations besides AB. From (2) we may infer, Any AB produces P; but obviously not—as in effect the example does—Any B produces P. For A may be the actual cause, and need not, as we now know or consider, be an invariable accompaniment of B.

And universally, if in ascertaining a cause we find that, in a particular case, AB contains the cause of P, we may go on to say, Any AB produces P, Any P has its cause either in A or in B. Similarly, if in ascertaining an effect we find that, in a particular case, A has as its specific effect either P or Q, we may go on to say, Any A produces either P or Q, Any PQ has A as one of its causes.

In the case of our having knowledge, howsoever obtained, that two single phenomena, this A and this P, are cause and effect, then we may infer, Any P has its cause in A, and, Any A produces P. We may likewise make the inferences, That other P has its cause in A, That other A produces P.

Deduction, whether from a pair of particulars to another pair of particulars, or from a pair of particulars to a pair of abstract phenomena, appears to be neither more nor less than a necessary movement of the mind by which it reaches again and again, in relation to particular instances that come before it, the truth that uniformity exists in nature. If the mind has before it a particular A as the known cause of a particular P, and sees, or conceives the idea of, another phenomenon precisely similar to P, proceeding from some cause, then it cannot but picture to itself, as this cause, particular or abstract as the case may be, a phenomenon precisely similar to A. Or if it has before it P as the known

effect of A, and contemplates another instance of A acting as a cause, it cannot but picture to itself as the effect, particular or abstract as the case may be, a phenomenon precisely similar to P. Accordingly as the newly contemplated effect or cause is particular or abstract, so the newly ascertained relation of causation will take a particular or an abstract form. From the proposition, My father was mortal because he was a man, the mind can pass, either to the particular truth, I am mortal because I am a man, or to the abstract truth, Any man is mortal because he is a man.

It is not, however, by any means contended that on every occasion, when the mind becomes conscious of a fact of so common a nature as the liability to death of this or that individual, it goes through a fresh process of deductive inference. Having been once led to apprehend distinctly and firmly the general or abstract truth, Any man is mortal because he is a man, it would seem to hold it in readiness for application to subsequent particular cases that come before it. Or rather, perhaps—and this is much the same thing—it may be said to carry about with it the idea of mortality as part of an enlarged conception of the attributes of manhood. The mind having once grasped, by means of deduction, a general or abstract truth, seems freed from the necessity of making subsequent particular deductions. It remembers or it knows, when it looks upon phenomenon P or A, that there is another phenomenon A or P existing in causal connection with it.

Nor, again, is it necessary to suppose that the mind makes a deductive inference whenever, from apprehension of the fact, This A is a cause of P, it becomes conscious of the fact, Any A is a cause of P. It may be that it carries about with it, so to speak, as part of an enlarged conception of causation, originally obtained by deduction, the idea that

a causal relation found to exist in any one pair of particular phenomena exists also in any pair whatsoever of similar phenomena. Having once grasped, by means of deduction, the idea of uniformity in nature, it seems freed from the necessity of using deduction in every fresh case in order to arrive at an abstract or general conclusion. It may remember, when it becomes aware of a causal relation between a particular A and P, that the same connection exists between any A and P, or between A and any P.

II. The subject of logical inference, to the end of which we have now come, can scarcely be dismissed without some notice of syllogistic argument.

In treatises on logic the major premise of a syllogism is given in the form of a universal proposition, of which All A is P may be taken as the type. Now it is important that we should clearly understand what these universals are intended to express. What warrant have we for laying down such propositions as, All men are mortal, All magnets attract iron? And what are the consequences that follow from them? What is the nature and the value of the argument, All men are mortal, John is a man, Therefore he is mortal? or of the argument, All magnets attract iron, This is a magnet, Therefore it will attract iron?

I. If the universals are simply loose ways of expressing the inferred conclusions, Any man is mortal because he is a man, Any magnet attracts iron because it is a magnet, they may be interpreted in two slightly different ways. They may be understood to record facts in connection with men and magnets, a knowledge of which the mind has by induction and deduction become possessed of; or they may be understood to announce new and enlarged conceptions of men and magnets, which the mind henceforward entertains.

In the former case the assertion is made that, wherever a man exists, that man is mortal; or, wherever a magnet

exists, that magnet attracts iron. This is the major premise of a syllogism. The minor premise, John is a man, This is a magnet, points out a particular man, or a particular magnet. And the conclusion, John is mortal, This magnet will attract iron, announces that the mind sees the man, or sees the magnet, and repeats, with reference to him, or with reference to it, the assertion which it made in the major premise. The word 'therefore,' which introduces the conclusion, does not imply any inference, any passage of the mind from old to new truth. It does not imply an inference any more than it would imply it, if the argument were worded thus: John is mortal, therefore he is mortal, or, This magnet will attract iron, therefore it will attract iron. The assertion of the conclusion follows from the assertion of the major premise, only because it is seen to be contained in it.

If we understand the universals in the latter of the two senses, then the assertion is made, that the mind henceforward refuses to acknowledge as a man any creature who is not mortal, or as a magnet any piece of iron or steel that does not attract metal. A man is a creature who has, among his attributes, that of mortality; a magnet is a piece of iron or steel which has, among its properties, that of attracting iron. The major premise is in this case nothing but a definition. And it is the minor premise, John is a man, This is a magnet, which makes an assertion, in which the assertion of the conclusion is manifestly contained.

In whichever way we interpret the general or abstract proposition which constitutes the major premise of the syllogism, there is in the syllogism itself no inference. The conclusion is contained in, and extracted from, either the major premise made applicable by the minor to a particular case, or else the minor premise read in the light afforded by the major.

2. If the universals are to be taken literally as collective statements, they may again be interpreted in two different ways. They may be understood to announce the results of observation, or they may be conceived to announce the results of a thoroughly exhaustive application of an act of inference.

In the former case it is declared, that all men who have sufficiently come under observation have failed to live beyond a certain number of years, or that all pieces of iron or steel that have been brought into a given kind of contact with loadstone have, when tested, exhibited the property of attracting iron. The propositions are simple statements of observed fact. They are not conclusions from inference, nor does the conception of causation enter into them. If they are made major premises of syllogisms, the conclusions of these syllogisms can only repeat a part of what they assert. The syllogisms will run thus: All observed men are mortal, John is one of the observed men, Therefore he is mortal; All observed magnets have the property of attracting iron, This is one of the observed magnets, Therefore it has the property of attracting iron.

But we may suppose the inferences to have been made, Any man is mortal, Any magnet attracts iron. If then the mind should picture to itself man after man, or magnet after magnet, it would know of each, that he is mortal, or that it attracts iron. And if we imagine this process carried on exhaustively, so as to include all men whatsoever, or all magnets whatsoever, the mind would be entitled to pronounce literally and absolutely, as a part of its own knowledge, All men are mortal, All magnets attract iron. These true universals, if employed as major premises of syllogisms, would, as in the preceding case, contain the particular conclusions that follow from them.

III. The view of the meaning of syllogistic argument con-

tained in the foregoing remarks is very much in accord with that of Mill. That is to say, he likewise holds that in the syllogism there is no fresh inference. He writes as follows: "When, therefore, we conclude from the death of John and Thomas, and every other person we ever heard of in whose case the experiment had been fairly tried, that the Duke of Wellington is mortal like the rest, we may, indeed, pass through the generalisation, All men are mortal, as an intermediate stage; but it is not in the latter half of the process, the descent from all men to the Duke of Wellington, that the *inference* resides. The inference is finished when we have asserted that all men are mortal. What remains to be performed afterwards is merely deciphering our own notes."¹

The following remarks on the practical value of the syllogism may be quoted with some approval. "The value, therefore, of the syllogistic form, and of the rules for using it correctly, does not consist in their being the form and the rules according to which our reasonings are necessarily, or even usually made; but in their furnishing us with a mode in which those reasonings may always be represented, and which is admirably calculated, if they are inconclusive, to bring their inconclusiveness to light. An induction from particulars to generals, followed by a syllogistic process from those generals to other particulars, is a form in which we may always state our reasonings if we please. It is not a form in which we *must* reason, but it is a form in which we may reason, and into which it is indispensable to throw our reasoning when there is any doubt of its validity: though when the case is familiar and little complicated, and there is no suspicion of error, we may, and do, reason at once from the known particular cases to unknown ones."²

¹ Bk. II. ch. iii. § 3.

² Id., § 5.

CHAPTER VI.

MILL'S "FOUR METHODS."

I. WE must now make some examination of Mill's general theory of inference.

Instead of four kinds of inference, differing essentially from one another, he recognises only one, which he terms induction. "We have thus obtained," he writes, "what we were seeking, an universal type of the reasoning process. We find it resolvable in all cases into the following elements: Certain individuals have a given attribute; an individual or individuals resemble the former in certain other attributes; therefore they resemble them also in the given attribute. . . . Whether from the attributes in which Socrates resembles those men who have heretofore died, it is allowable to infer that he resembles them also in being mortal, is a question of Induction; and is to be decided by the principles or canons which we shall hereafter recognise as tests of the correct performance of that great mental operation.

"Meanwhile, however, it is certain, as before remarked, that if this inference can be drawn as to Socrates, it can be drawn as to all others who resemble the observed individuals in the same attributes in which he resembles them; that is (to express the thing concisely), to all mankind. If, therefore, the argument be admissible in the case of Socrates, we are at liberty, once for all, to treat the possession of the attributes of man as a mark, or satisfactory evidence, of the attribute

of mortality. This we do by laying down the universal proposition, All men are mortal, and interpreting this, as occasion arises, in its application to Socrates and others. By this means we establish a very convenient division of the entire logical operation into two steps: first, that of ascertaining what attributes are marks of mortality; and, secondly, whether any given individuals possess those marks. And it will generally be advisable, in our speculations on the reasoning process, to consider this double operation as in fact taking place, and all reasoning as carried on in the form into which it must necessarily be thrown to enable us to apply to it any test of its correct performance.

“Although, therefore, all processes of thought in which the ultimate premises are particulars, whether we conclude from particulars to a general formula, or from particulars to other particulars according to that formula, are equally Induction; we shall yet, conformably to usage, consider the name Induction as more peculiarly belonging to the process of establishing the general proposition, and the remaining operation, which is substantially that of interpreting the general proposition, we shall call by its usual name, Deduction. And we shall consider every process by which anything is inferred respecting an unobserved case as consisting of an Induction followed by a Deduction; because, although the process needs not necessarily be carried on in this form, it is always susceptible of the form, and must be thrown into it when assurance of scientific accuracy is needed and desired.”¹

Induction, then, or inference, is the passage of the mind from certain observed facts to a new particular fact, or to a general conclusion. Deduction is not a mode of inference, but is only the interpretative or explanatory process presented in the syllogism, when the mind passes to a new particular fact by this circuitous route. What we have

¹ Bk. II. ch. iii. § 7.

regarded as deductive inference exists, if it exists at all, only as a part of a comprehensive process of induction. Induction, in Mill's view, accomplishes the work which has been assigned in this book to induction and deduction together.

Now, entirely waiving for the present the question whether there are not still other kinds of inference, waiving also for the present the question whether he makes out his case, that all inductive inferences may be referred to one universal type, let us consider carefully his exhibition of the different forms which the process of induction takes. These forms are methods of ascertaining causes and effects. "The general remarks on causation," he writes, "which seemed necessary as an introduction to the theory of the inductive process, may here terminate. That process is essentially an inquiry into cases of causation. . . . To ascertain, therefore, what are the laws of causation which exist in nature; to determine the effect of every cause, and the causes of all effects, is the main business of Induction; and to point out how this is done is the chief object of Inductive Logic."¹ And the principles or canons alluded to in the passage previously quoted are rules for the correct discovery of the causes of effects and effects of causes.

The canons or rules laid down by Mill are five in number, having relation to four methods of discovery. On the subject of these methods he writes as follows:—"The business of Inductive Logic is to provide rules and models (such as the Syllogism and its rules are for ratiocination), to which, if inductive arguments conform, those arguments are conclusive, and not otherwise. This is what the Four Methods profess to be, and what I believe they are universally considered to be by experimental philosophers, who had practised all of them long before any one sought to reduce the practice to theory."²

¹ Bk. III. ch. vi. § 3.

² Bk. III. ch. ix. § 6.

II. His first method is called by Mill the method of agreement. It is substantially the same as our method of comparison. He gives its canon thus:—"If two or more instances of the phenomenon under investigation have only one circumstance in common, the circumstance in which alone all the instances agree is the cause (or effect) of the given phenomenon."¹ And he introduces the canon with the following remarks:—"The mode of discovering and proving laws of nature, which we have now examined, proceeds on the following axiom. Whatever circumstances can be excluded, without prejudice to the phenomenon, or can be absent notwithstanding its presence, is not connected with it in the way of causation. The casual circumstance being thus eliminated, if only one remains, that one is the cause which we are in search of: if more than one, they either are, or contain among them, the cause; and so, *mutatis mutandis*, of the effect. As this method proceeds by comparing different instances to ascertain in what they agree, I have termed it the Method of Agreement."

Concerning this method, only two remarks need to be made, but they are both remarks of some importance.

The first is, that Mill states the principle on which the method is founded—obviously the principle of uniformity in nature—as an axiom. This in his case must be held to be entirely inadmissible. It must be contended that, his views of causation and uniformity in nature being what they are, he is not in the least entitled to assume, that to any phenomenon whatever that comes before him there is either an invariable antecedent or an invariable consequent, present in every instance of its presence. In what he offers as a fundamental axiom of scientific induction he assumes the universality of uniform causation, notwithstanding that this is, according to him, only a truth inferred by some kind of

¹ Bk. III. ch. viii. § 1.

informal induction, a kind of induction the supposed process of which he scarcely does more than hint at. We shall see later on in this chapter the measure of his success in indicating a possible way by which it might come to be inferred.

The second remark is as follows. Mill speaks of a characteristic imperfection of the method of agreement, which does not seem to be, in fact, attendant on it. We have already seen, in Chapter II., how he takes the view that, although a cause is invariably followed by the same effect, yet an effect is not invariably preceded by the same cause. And this supposed circumstance he looks upon as to some extent vitiating the method of agreement. "One of the principal consequences of this fact of Plurality of Causes is, to render the first of the inductive methods, that of Agreement, uncertain. To illustrate that method we supposed two instances, ABC followed by *abc*, and ADE followed by *ade*. From these instances it might apparently be concluded that A is an invariable antecedent of *a*, and even that it is the unconditional invariable antecedent or cause, if we could be sure that there is no other antecedent common to the two cases. That this difficulty may not stand in the way, let us suppose the two cases positively ascertained to have no antecedent in common except A. The moment, however, that we let in the possibility of a plurality of causes, the conclusion fails. For it involves a tacit supposition that *a* must have been produced in both instances by the same cause. If there can possibly have been two causes, those two may, for example, be C and E: the one may have been the cause of *a* in the former of the instances, the other in the latter, A having no influence in either case."¹

Now this alleged uncertainty does not seem to have any real existence, since plurality of causes, in the sense of different causes leading to effects precisely similar, does not

¹ Bk. III. ch. x. § 2.

appear to be a fact of nature. It must be held to be the case that, though we may be able to trace certain similar effects up to causes that are apparently different, yet these apparently different causes certainly contain some common element, from which proceeds that which is common to the similar effects. So far as the concrete effects, apparent to the view, really proceed from diverse causes, so far they are themselves, not similar, but diverse.

"Suppose," Mill goes on to say, "that two great artists or great philosophers, that two extremely selfish or extremely generous characters, were compared together as to the circumstances of their education and history, and the two cases were found to agree only in one circumstance: would it follow that this one circumstance was the cause of the quality which characterised both those individuals? Not at all; for the causes which may produce any type of character are very numerous; and the two persons might equally have agreed in their character, though there had been no manner of resemblance in their previous history. This, therefore, is a characteristic imperfection of the Method of Agreement."

To this the following answer may obviously be made. First, the greatness of one artist or philosopher, the extreme selfishness or generosity of one character, is very far from being, as an observed effect, precisely similar to that of another. Secondly, so far as the compared phenomena are different, so far they are the product of different causes. But thirdly, so far as they have elements in common, so far there must have been among their antecedents circumstances precisely similar, from which, as causes, these common elements have certainly proceeded.

III. The second method, that of difference, is presented—not ostensibly, but really—in two quite different forms. In the form about which least is said it is associated with the method of agreement in what Mill terms the joint method of agreement

and difference. In this form, which it will be convenient to consider first, it is nearly allied to our method of contrast.

"Suppose," says Mill, "that as we previously examined a variety of instances in which a occurred, and found them to agree in containing A , so we now observe a variety of instances in which a does not occur, and find them agree in not containing A ; which establishes, by the Method of Agreement, the same connection between the absence of A and the absence of a , which was before established between their presence. As, then, it had been shown that whenever A is present a is present, so it being now shown that when A is taken away a is removed along with it, we have by the one proposition ABC , abc , by the other BC , bc , the positive and negative instances which the Method of Difference requires. This method may be called the Indirect Method of Difference, or the Joint Method of Agreement and Difference, and consists in a double employment of the Method of Agreement, each proof being independent of the other, and corroborating it."¹

And of this joint method he states the following as the canon :—"If two or more instances in which the phenomenon occurs have only one circumstance in common, while two or more instances in which it does not occur have nothing in common save the absence of that circumstance, the circumstance in which alone the two sets of instances differ is the effect, or the cause, or an indispensable part of the cause, of the phenomenon."¹

Our method of contrast, it will be remembered, consists in eliminating from the antecedents of a , or consequents of A , any one which is found to be present in other sets of circumstances from which a , or A , is absent. The method was presented as an aid to, or a substitute for, the method of comparison in the work of eliminating impossible causes or

¹ Bk. III. ch. viii. § 4.

effects. Mill appears to look upon his kindred method as a test of the correctness of the conclusion established by the method of agreement. He supposes, or seems to suppose that, A having been found by the method of agreement, search is made among diverse sets of circumstances not containing a to see if A is in truth absent from them all. The method of contrast says that, if ADE is followed by aS , DF by l , and EG by m , where l and m do not contain a , then neither D nor E can be a cause of a . The joint method of agreement and difference says, or seems to say, that if (1) ADE is followed by aS , ADF by al , AEG by am , and if (2) HK is followed by p , KL by q , LM by r , where p , q , r do not contain a , then (1) points to A as a cause since it is always present when a is present, and (2) corroborates this view by showing that A is invariably absent when a is absent. The method of contrast casts out D and E from ADE, instead of this being done by the method of comparison; the joint method supposes these two to be cast out by the method of agreement, and then consents to let A stand. In either case the principle is employed, that a cause cannot be present in the absence of the effect.

But what possible ground has Mill for the statement, that the two general truths—the invariable presence of A when a is present, and its invariable absence when a is absent—may be expressed, relatively to each other, by the pair of symbols, ABC followed by abc , and BC followed by bc ? If A be here taken to represent all instances of the antecedent, or an average instance of it, or any instance of it whatsoever, how can it possibly be said, either (1) that the sum, BC in ABC, of all antecedents that combine with A is precisely similar to the sum, BC standing alone, of all that do not combine with it; or (2) that the average of the one set of antecedents is precisely similar to the average of the other; or (3) that those combining with any

given instance of A are precisely similar to those not combining with it?

Further, if it is conceivable that ABC and BC are legitimately employed, where is the ground for introducing here the exact consequents, *abc* and *bc*, of the given antecedents?

IV. This ABC followed by *abc* and BC by *bc*, leading to the conclusion that A and *a* are cause and effect, is the other form of the method of difference spoken of above. On the efficacy of this method Mill lays considerable stress. The following is its canon:—"If an instance in which the phenomenon under investigation occurs, and an instance in which it does not occur, have every circumstance in common save one, that one occurring only in the former; the circumstance in which alone the two instances differ is the effect, or the cause, or an indispensable part of the cause, of the phenomenon."¹

Concerning the method he says: "In the Method of Agreement, we endeavoured to obtain instances which agreed in the given circumstance but differed in every other: in the present method we require, on the contrary, two instances resembling one another in every other respect, but differing in the presence or absence of the phenomenon we wish to study. If our object be to discover the effects of an agent A, we must procure A in some set of ascertained circumstances, as ABC, and having noted the effects produced, compare them with the effect of the remaining circumstances BC, when A is absent. If the effect of ABC is *abc*, and the effect of BC, *bc*, it is evident that the effect of A is *a*. So again, if we begin at the other end, and desire to investigate the cause of an effect *a*, we must select an instance, as *abc*, in which the effect occurs, and in which the antecedents were ABC, and we must look out for another instance in which the remaining circumstances, *bc*, occur without *a*. If the antecedents, in that instance, are BC, we know that the

¹ Bk. III. ch. viii. § 2.

cause of a must be A : either A alone, or A in conjunction with some of the other circumstances present."¹

The method, it will be observed, consists, not in eliminating one by one, from a set of antecedents ABC or of consequents abc , all impossible causes or effects, but in subtracting from a set of antecedents and a set of corresponding consequents all those which are already known to be causally related. The antecedents and consequents that remain, or the antecedent and consequent should there be but one, will stand to each other in the relation of cause and effect.

What has just been said is, perhaps, the most obvious way of interpreting the remarks that have been quoted. This interpretation, however, Mill appears to regard as descriptive only of a secondary application of the method of difference, an application which constitutes his third method, namely, that of residues. Of this method the canon is as follows:—"Subduct from any phenomenon such part as is known by previous inductions to be the effect of certain antecedents, and the residue of the phenomenon is the effect of the remaining antecedents."²

What Mill looks upon as the primary interpretation of the method of difference we may perhaps gather from the axioms upon which he considers it to be based. He says: "The axioms implied in this method are evidently the following. Whatever antecedent cannot be excluded without preventing the phenomenon, is the cause, or a condition of that phenomenon: Whatever consequent can be excluded, with no other difference in the antecedents than the absence of a particular one, is the effect of that one."³

These two axioms seem to say no more than this: If a detached cause obviously has no effect but the phenomenon, or a detached effect obviously has no cause but the phenomenon, it is the cause, or the effect, of the phenomenon. Or,

¹ Bk. III. ch. viii. § 2.

² Id., § 5.

³ Id., § 2.

in other words, If a single antecedent and a single consequent can be detached from a mass of antecedents and consequents without affecting the remainder of the mass, they are certainly related as cause and effect. The method based on these axioms, or this axiom, seems to differ from that of residues only in taking away, from ABC and abc , A and a instead of BC and bc . In the one case subtraction may be supposed to be made, in order to prove the truth of a conjecture; in the other, for the purpose of ascertaining what will be left.

With regard to this method of difference, there is no doubt that, if instances can be found of ABC followed by abc and BC by bc , we may assure ourselves at once that A and a are cause and effect. But it cannot for a moment be allowed that finding such instances is commonly practicable. It must be contended, that in all the cases of ordinary life to which this method may seem to be theoretically applicable we already know, on other grounds, that A and a are causally related. We do not conclude that A and a are cause and effect, because we have ABC followed by abc and BC by bc ; but, knowing that BC is followed by bc and A by a , we may, if we will, put them together and say—if we think we are justified in saying it—that we have ABC and abc . Mill, however, greatly exalts the potency of this method of difference as an instrument for the discovery of causes and effects. "It thus appears," he writes, "to be by the Method of Difference alone that we can ever, in the way of direct experience, arrive with certainty at causes."¹ And by way of giving a simple illustration of the employment of the method he says, "As a truth made known by the Method of Difference, 'Fire burns' might have sufficed. Before I touch the fire I am not burnt; this is BC ; I touch it, and am burnt; this is ABC , aBC ."² But it cannot be at all admitted that knowledge of the fact, that fire is the

¹ Bk. III. ch. viii. § 3.

² Bk. III. ch. ix. § 6.

cause of burning, is actually arrived at in the manner indicated. It may be safely asserted, that we have no more valid reason for concluding that all the accompanying antecedents and consequents, here represented together by BC, remain after the burning exactly as they were before the burning, than we have for concluding directly by means of observation and reflection, without any reference whatever to these accompanying circumstances, that the burning, whose cause is sought, was the effect of fire. We know, in fact—if, that is, we do know—that they remain the same, only because we are aware that the new cause, fire, produces burning, and burning only, as its own proper effect.

V. Of the fourth method, called the method of concomitant variations, something may now be said. It consists in discovering, or partly discovering, a causal connection between two phenomena by observing that variations in the one are accompanied by variations in the other. The canon is this: "Whatever phenomenon varies in any manner whenever another phenomenon varies in some particular manner, is either a cause or an effect of that phenomenon, or is connected with it through some fact of causation." It is stated to be based on this axiom or proposition: "Anything on whose modifications, modifications of an effect are invariably consequent, must be the cause (or connected with the cause) of that effect." And as a sufficient reason for accepting this as true, it is remarked that, "if the thing itself had no influence on the effect, neither could the modifications of the thing have any influence."¹

A cause, then, is something, not only which precedes, but which manifestly influences the effect. Modifications of an effect are, not only consequent upon, but produced by, modifications of the cause. The occurrence of corresponding changes in two phenomena is sufficient to show

¹ Bk. III. ch. viii. § 6.

that some relation of causation, direct or indirect, exists between them. But surely this is a different view of causation from that which Mill has maintained to be the true one, namely, that the relation between a cause and its effect is merely one of succession. Surely, too, this fourth method is no more than equivalent to this—that, if from the gradual evidence of our senses we are aware that one phenomenon causes another, or with another proceeds from a common cause, then we know that there exists between them some relation of causation.

VI. The mind, having discovered by means of the rules given, from the few instances before it, that two phenomena are cause and effect, is, in Mill's view, at once in possession of a law of nature. Every phenomenon has a cause, and an effect, with which it is connected by a law of nature; and cause and effect are to be determined, if they can be determined at all, only by means of the four methods.

Of the idea of necessity, which is supposed to be inherent in the idea of observed invariableness in the past—necessity, which establishes the observed invariable succession of phenomena as a law of nature—enough has been already said in our second chapter. We have now to turn our attention to the idea of universality, which we were not then in a position to discuss. We have to inquire on what ground it is that every effect, observed and unobserved, may be held to have a cause of which it is the invariable consequent, and every cause an effect by which it is invariably followed. We have to examine into the tenability of Mill's view of the origin of the idea of universal causation. He admits that in induction the principle is assumed, and yet he contends that it is itself an inferred truth. "Whatever be the most proper mode of expressing it, the proposition that the course of nature is uniform is the fundamental principle, or general axiom, of Induction. It would yet be

a great error to offer this large generalisation as any explanation of the inductive process. On the contrary, I hold it to be itself an instance of induction, and induction by no means of the most obvious kind. Far from being the first induction we make, it is one of the last, or at all events one of those which are latest in attaining strict philosophical accuracy."¹

In what way he considers induction to be dependent on the principle of universal causation, he indicates in the following passage:—"The validity of all the Inductive Methods depends on the assumption that every event, or the beginning of every phenomenon, must have some cause, some antecedent, on the existence of which it is invariably and unconditionally consequent. In the Method of Agreement this is obvious; that method avowedly proceeding on the supposition that we have found the true cause as soon as we have negated every other. The assertion is equally true of the Method of Difference. That method authorises us to infer a general law from two instances; one, in which A exists together with a multitude of other circumstances, and B follows; another, in which A being removed, and all other circumstances remaining the same, B is prevented. What, however, does this prove? It proves that B, in the particular instance, cannot have had any other cause than A; but to conclude from this that A was the cause, or that A will on other occasions be followed by B, is only allowable on the assumption that B must have some cause; that among its antecedents in any single instance in which it occurs, there must be one which has the capacity of producing it at other times. This being admitted, it is seen that in the case in question that antecedent can be no other than A; but, that if it be no other than A it must be A, is not proved, by these instances at least, but taken for granted. There is no need to spend time in proving that

¹ Bk. III. ch. iii. § 1.

the same thing is true of the other Inductive Methods. The universality of the law of causation is assumed in them all."¹

This statement of his position in assuming the principle appears to have reference only to the use made of it in passing at once from the discovery, that A and *a* are cause and effect in a particular case, to apprehension of the universal law, that any A is a cause of *a*. He does not seem, either here or elsewhere, to direct attention to his assumption of it in setting forth the methods of discovery. It is assumed, as we have already noticed, in the axiom upon which he bases the method of agreement: it is also assumed in the axioms of the method of difference, if the BC standing by itself is not identical with that in ABC.

It is, perhaps, worth while to point out, that the introduction of axioms as a ground of induction is itself—apart from their content—an instance of basing induction upon a product of induction; if, that is, we may accept his view of axioms. For he writes, "We have thought ourselves warranted in concluding that axioms are but a class, the most universal class, of inductions from experience; the simplest and easiest cases of generalisation from the facts furnished to us by our senses or by our internal consciousness."²

VII. Now Mill attempts to reconcile the apparent contradiction of basing induction upon a product of induction by means of an explanation which must be accounted quite impossible. He contends that there is a loose and unscientific process of generalising, which is essentially different from that of scientific induction. While the latter rests upon the principle of universal and uniform causation, the former is quite independent of it. And it is by means of unscientific, not of scientific, generalising or induction that the mind becomes possessed of the idea of universal causation. Being put in possession of the principle by unscientific

¹ Bk. III. ch. xxi. § 1.

² Bk. II. ch. vi. § 1.

generalising, it employs it as the basis of induction conducted after scientific methods.

This is what Mill says on the subject :—"As was observed in a former place, the belief we entertain in the universality, throughout nature, of the law of cause and effect, is itself an instance of induction, and by no means one of the earliest which any of us, or which mankind in general, can have made. We arrive at this universal law by generalisation from many laws of inferior generality. We should never have had the notion of causation (in the philosophical meaning of the term) as a condition of all phenomena, unless many cases of causation, or, in other words, many partial uniformities of sequence, had previously become familiar. The more obvious of the particular uniformities suggest, and give evidence of, the general uniformity, and the general uniformity, once established, enables us to prove the remainder of the particular uniformities of which it is made up. As, however, all rigorous processes of induction presuppose the general uniformity, our knowledge of the particular uniformities from which it was first inferred was not, of course, derived from rigorous induction, but from the loose and uncertain mode of induction *per enumerationem simplicem*; and the law of universal causation, being collected from results so obtained, cannot itself rest on any better foundation."¹

There is no occasion for us to follow the argument by which he seeks to show that the law of universal causation, though obtained by a method that is loose, is, in consequence of the vast mass of experience with which it is in accord, worthy of complete confidence, and fit to be the basis of scientific operations. Its trustworthiness, as derived from unscientific generalising, is not a point with which we are at all concerned: what we have to be convinced of is the possibility of so deriving it.

¹ Bk. III. ch. xxi. § 2.

It will be observed that in the passage just quoted Mill speaks of the particular uniformities, from which the law is inferred, as being themselves instances of loose and unscientific generalising, or induction *per simplicem enumerationem*. By these uniformities we must apparently understand supposed laws of nature, such as, Any A is the cause of *a*, Any B is the cause of *b*. And, apparently, Mill's contention is, that from the premises, Any A is the cause of *a*, Any B is the cause of *b*, and a number of others of the same kind—all obtained by loose generalising—the mind in some way passes to the conclusion, Any phenomenon whatsoever has a cause.

Perhaps, before proceeding with the question of the existence of any mode of generalising other than induction proper, we had better notice what Mill tells us of the employment of the supposed method. He writes thus concerning it:—“To an inhabitant of Central Africa fifty years ago, no fact probably appeared to rest on more uniform experience than this, that all human beings are black. To Europeans not many years ago, the proposition, All swans are white, appeared an equally unequivocal instance of uniformity in the course of nature. Further experience has proved to both that they were mistaken; but they had to wait fifty centuries for this experience. During that long time, mankind believed in an uniformity of the course of nature where no such uniformity really existed.

“According to the notion which the ancients entertained of induction, the foregoing were cases of as legitimate inference as any inductions whatever. In these two instances, in which, the conclusion being false, the ground of inference must have been insufficient, there was, nevertheless, as much ground for it as this conception of induction admitted of. The induction of the ancients has been well described by Bacon, under the name of ‘Inductio per enumerationem simplicem, ubi non reperitur instantia contradictoria.’ It

consists in ascribing the character of general truths to all propositions which are true in every instance that we happen to know of. This is the kind of induction which is natural to the mind when unaccustomed to scientific methods. The tendency, which some call an instinct, and which others account for by association, to infer the future from the past, the known from the unknown, is simply a habit of expecting that what has been found true once or several times, and never yet found false, will be found true again. Whether the instances are few or many, conclusive or inconclusive, does not much affect the matter: these are considerations which occur only on reflection; the unprompted tendency of the mind is to generalise its experience, provided this points all in one direction; provided no other experience of a conflicting character comes unsought. The notion of seeking it, of experimenting for it, of *interrogating* nature (to use Bacon's expression), is of much later growth. The observation of nature by uncultivated intellects is purely passive: they accept the facts which present themselves, without taking the trouble of searching for more: it is a superior mind only which asks itself what facts are needed to enable it to come to a safe conclusion, and then looks out for these.

"But though we have always a propensity to generalise from unvarying experience, we are not always warranted in doing so. Before we can be at liberty to conclude that something is universally true because we have never known an instance to the contrary, we must have reason to believe that if there were in nature any instances to the contrary, we should have known of them. This assurance, in the great majority of cases, we cannot have, or can have only in a very moderate degree. The possibility of having it is the foundation on which we shall see hereafter that induction by simple enumeration may in some remarkable cases amount practically to proof. No such assurance, however, can be

had on any of the ordinary subjects of scientific inquiry. Popular notions are usually founded on induction by simple enumeration; in science it carries us but a little way. We are forced to begin with it; we must often rely on it provisionally, in the absence of means of more searching investigation. But, for the accurate study of nature, we require a surer and a more potent instrument."¹

In answer to this it must be maintained—in accordance with the exposition of Chapter IV.—that the distinction which appears to be drawn between induction by simple enumeration and scientific induction, as essentially different mental processes, is illusory. It must be contended, that unscientific generalising from experience is, in kind, precisely the same mental operation as inferring a general proposition by means of the method of comparison or agreement. True it is, that in the one case the process is more or less unconscious, and the mind is satisfied with such instances of the phenomenon as come before it; while in the other case the process is conscious and deliberate, and the mind takes pains to bring together a large variety of instances. And true it is, that in the one case the mind rests upon prominent circumstances which seem to be conspicuously common to the observed phenomena; while in the other case it institutes a careful comparison to ascertain what circumstances are to be excluded and what retained. But neither the measure of self-consciousness with which the mind works, nor the extent of the field of similar instances over which it ranges, nor the degree of thoroughness and accuracy with which it compares the different sets of circumstances, can properly be held to make any difference whatever in the essential character of its action in inferring.²

¹ Bk. III. ch. iii. § 2.

² Some further remarks on this subject of supposed unscientific generalising will be found in the first section of Chapter X.

But, having before us the general propositions, Any A is the cause of α , and the others, let us see what Mill has to say concerning the 'collection' of the principle, Any phenomenon has a cause, from these results.

"It deserves remark," he says in a foot-note, "that these early generalisations did not, like scientific inductions, presuppose causation. What they did presuppose, was *uniformity* in physical facts. But the observers were as ready to presume uniformity in the co-existences of facts as in the sequences. On the other hand, they never thought of assuming that this uniformity was a principle pervading all nature; their generalisations did not imply that there was uniformity in everything, but only that as much uniformity as existed within their observation, existed also beyond it. The induction, Fire burns, does not require for its validity that all nature should observe uniform laws, but only that there should be uniformity in one particular class of natural phenomena; the effects of fire on the senses and on combustible substances. And uniformity to this extent was not assumed, anterior to the experience, but proved by the experience. The same observed instances which proved the narrower truth, proved as much of the wider one as corresponded to it. It is from losing sight of this fact, and considering the law of causation in its full extent as necessarily presupposed in the very earliest generalisations, that persons have been led into the belief that the law of causation is known *à priori*, and is not itself a conclusion from experience."¹

And in another place he writes, also in a foot-note, to much the same effect. "Though it is a condition of the validity of every induction that there be uniformity in the course of nature, it is not a necessary condition that the uniformity should pervade all nature. It is enough that

¹ Bk. III. ch. xxi. § 2.

it pervades the particular class of phenomena to which the induction relates. An induction concerning the motions of the planets, or the properties of the magnet, would not be vitiated though we were to suppose that wind and weather are the sport of chance, provided it be assumed that astronomical and magnetic phenomena are under the dominion of general laws. Otherwise the early experience of mankind would have rested on a very weak foundation; for in the infancy of science it could not be known that *all* phenomena are regular in their course.

"Neither would it be correct to say that every induction by which we infer any truth implies the general fact of uniformity *as foreknown*, even in reference to the kind of phenomena concerned. It implies, *either* that this general fact is already known, *or* that we may now know it: as the conclusion, the Duke of Wellington is mortal, drawn from the instances A, B, and C, implies either that we have already concluded all men to be mortal, or that we are now entitled to do so from the same evidence. A vast amount of confusion and paralogism respecting the grounds of induction would be dispelled by keeping in view these simple considerations."¹

The principal meaning of these passages appears to be as follows. First, from the premises, A, B, C are mortal, we may infer either, The Duke of Wellington is mortal, or, Any man is mortal; which contention is no doubt perfectly valid. Secondly, the conclusion, Any man is mortal—or its equivalent, Manhood is the cause of mortality—makes us acquainted for the first time with the fact, that mortality has a cause or invariable antecedent; from which position we must emphatically dissent.

For the passage of the mind from the premises, A, B, C are mortal, to the conclusion, Manhood is the cause of

¹ Bk. III. ch. iii. § 1.

mortality, seems certainly to be made by means of a deductive inference from the intermediate conclusion, The manhood of A, B, C is the cause of their mortality. And this conclusion, it is maintained, cannot be reached without some recognition of the principles of causation and uniformity in nature. Whether the mind acts consciously or unconsciously, an essential means of arriving at the knowledge, that it is the manhood of A, B, C which makes them subject to death, appears to be the preliminary knowledge, that a uniform cause of death exists somewhere among their attributes or surroundings.

Since, then, it appears to be impossible for the mind to pass from the premises, A, B, C are mortal, to the conclusion, Manhood is the cause of mortality, without employing the conception, The mortality of A, B, C has some common or invariable antecedent, it must be steadfastly denied that the proposition, Human mortality has a cause, is a truth inferred by generalisation or induction, at the same time with the conclusion, Manhood is the cause of mortality, or, Any man is mortal.

Accordingly, if it is contended that, as the proposition, Any man is mortal, is inferred, or is inferable, at the same time with the proposition, The Duke of Wellington is mortal, so the proposition, Any phenomenon has a cause, is inferred, or is inferable, at the same time with the proposition, Human mortality has a cause; this less general proposition, again, being an inference contained in the conclusion, Manhood is the cause of mortality, or, Any man is mortal; if this is what Mill contends—and perhaps it is—then it must, if only for the reason above stated, be entirely denied that such a derivation of the law of universal causation is at all possible.

CHAPTER VII.

THE GREAT FALLACY IN MILL'S "LOGIC."

I. A THOUGHTFUL student of Mill's *System of Logic*, having been attracted by its initial promise, and led on by the seeming candour and lucidity of its style, is not unlikely to find himself, at the conclusion of his reading, in a state of perplexity bordering on despair. Having started with good hope that there will be unfolded to him a consistent and intelligible theory of inference, he may, on looking back, remember or discover instances not a few of inconsistency of statement and confusion of thought. Whatever information he may incidentally have gained—and it is far from being denied that there is in the book much valuable information and sound discussion—he may, after long pondering, be conscious that he has failed to grasp even the fundamental positions which, as he supposes, it is the author's intention to establish. Bearing in mind Mill's assurances, that the canons of inference presented to the reader will be based upon analysis of the mind's action in inferring, and that all inference belongs to one universal type, here spoken of as induction, it will be to him a source of wondering disappointment that his view of the teaching of the book is so cloudy and confused. What, he may at length impatiently exclaim, after all this argument is it that Mill intends his readers to understand by induction? Where in his many pages is there any real attempt

to give a clear account of the mental process of making inference?

At the beginning of his treatise Mill makes the following remarks:—"Logic has often been called the Art of Reasoning. A writer who has done more than any other person to restore this study to the rank from which it had fallen in the estimation of the cultivated class in our own country, has adopted the above definition with an amendment; he has defined Logic to be the Science, as well as the Art, of reasoning; meaning by the former term, the analysis of the mental process which takes place whenever we reason, and by the latter, the rules, grounded on that analysis, for conducting the process correctly. There can be no doubt as to the propriety of the emendation. A right understanding of the mental process itself, of the conditions it depends on, and the steps of which it consists, is the only basis on which a system of rules, fitted for the direction of the process, can possibly be founded."¹ And a little farther on he writes thus: "Our object, then, will be, to attempt a correct analysis of the intellectual process called Reasoning or Inference, and of such other mental operations as are intended to facilitate this: as well as, on the foundation of this analysis, and *pari passu* with it, to bring together or frame a set of rules or canons for testing the sufficiency of any given evidence to prove any given proposition."²

With regard to the first part of this initial statement and this initial promise, that part which has reference to analysis of mental processes, he presently goes on to say, quite reasonably and justifiably: "I shall, accordingly, attempt to analyse the process of inference, and the processes subordinate to inference, so far only as may be requisite for ascertaining the difference between a correct and an incorrect performance of those processes. The reason for thus limit-

¹ Introduction, § 2.

² Id., § 7.

ing our design, is evident. It has been said by objectors to logic, that we do not learn to use our muscles by studying their anatomy. The fact is not quite fairly stated; for if the action of any of our muscles were vitiated by local weakness, or other physical defect, a knowledge of their anatomy might be very necessary for effecting a cure. But we should be justly liable to the criticism involved in this objection, were we, in a treatise on logic, to carry the analysis of the reasoning process beyond the point at which any inaccuracy which may have crept into it must become visible. In learning bodily exercises (to carry on the same illustration) we do, and must, analyse the bodily motions so far as is necessary for distinguishing those which ought to be performed from those which ought not. To a similar extent, and no further, it is necessary that the logician should analyse the mental processes with which logic is concerned.”¹

Now surely we are entitled, after this exordium, to expect that some serious attempt will be made to explain analytically and intelligibly the normal action of the mind in making inferences. We are entitled to expect that, when canons of inference are propounded, we shall find ourselves addressed as students of philosophy, wishing to understand the essential principles upon which they are based, and not merely as learners of an art, desiring to be made acquainted with useful rules for practical application. We are entitled to expect that there will be an exhibition of the salient points in the normal course of the mind’s passage from premises to conclusion, and that the connection between this course and the practical rules or canons, which are offered as tests of its having been correctly taken, will be made apparent. If, however, we expect this, our expectation will be unsatisfied.

Again, Mill writes as follows:—“We have thus obtained what we were seeking, an universal type of the reasoning

¹ Introduction, § 7.

process."¹ And later on, speaking with special reference to Whewell's objections to his four methods, he says, "Dr. Whewell's argument, if good at all, is good against all inferences from experience. In saying that no discoveries were ever made by the Four Methods, he affirms that none were ever made by observation and experiment; for assuredly if any were, it was by processes reducible to one or other of those methods."²

With these statements before us there are two things which surely we may reasonably look for. Even though we may not be put in possession of the secret of the methods and their canons, yet surely we may reasonably expect to find in them the two characteristics of unity and completeness. We may reasonably expect to be satisfied, that they do in truth belong to one and the same type of inference, and that there is no other type, beyond them, needing to be separately treated of. We may reasonably expect that, if there appear to be substantial diversities of mental process within their scope, these shall be in some way harmonised; and that inferences apparently lying beyond their scope shall be satisfactorily shown to be within it. But if we expect this, here, again, we shall meet with disappointment.

This twofold failure to satisfy expectation aroused by promise and statement of the author—the failure, that is, to explain the mental process of inferring, and the failure to exhibit the inferences made as belonging to one universal type—constitutes, together with the course of argument, which renders the failure extremely difficult to detect, what may be designated the great fallacy of Mill's treatise.

II. Quickly enough—it may be briefly pointed out—Mill seems to abandon his intention of putting before his readers an analysis of the mind's action in inferring. We find him, somewhat early in his treatise, writing thus: "An inquiry

¹ Bk. II. ch. iii. § 7.

² Bk. III. ch. ix. § 6.

into the nature of propositions must have one of two objects : to analyse the state of mind called Belief, or to analyse what is believed. All language recognises a difference between a doctrine or opinion, and the fact of entertaining the opinion ; between assent, and what is assented to. Logic, according to the conception here formed of it, has no concern with the nature of the act of judging or believing ; the consideration of that act, as a phenomenon of the mind, belongs to another science."¹

Even if this rejection of the act of believing from the domain of logic does not itself include a reversal of his previous statement and promise concerning the process of reasoning, the fact remains that, in presenting to us his canons of induction, he seems to make no serious attempt at all to exhibit them as founded upon an analysis of mental action.

III. Let us now, laying aside the question of the mental process of induction, and understanding by induction—as, apparently, Mill would have us do—only the work achieved by that process, make some inquiry into the nature of this work. What is it that in induction is, somehow, actually accomplished ? Whatever may be the method of the mind's working, what are the materials which it employs, and what the fabric which by it is constructed from them ? Whatever may be the precise course that it follows, what are the premises from which it sets out, and what the conclusions which it eventually reaches ? What, in respect of its beginning and its end, is the one universal type of inference ?

To this question an answer—or, rather, answers—may be found in the following statements.

(I.) "We have thus obtained what we were seeking, an universal type of the reasoning process. We find it resolv-

¹ Bk. I. ch. v. § 1.

able in all cases into the following elements: Certain individuals have a given attribute; an individual or individuals resemble the former in certain other attributes; therefore they resemble them also in the given attribute."¹

(2.) "Quitting for the present the Method of Agreement, to which we shall almost immediately return, we proceed to a still more potent instrument of the investigation of nature, the Method of Difference. In the Method of Agreement, we endeavoured to obtain instances which agreed in the given circumstances but differed in every other: in the present method we require, on the contrary, two instances resembling one another in every other respect, but differing in the presence or absence of the phenomenon we wish to study.

"It is scarcely necessary to give examples of a logical process to which we owe almost all the inductive conclusions we draw in early life. When a man is shot through the heart, it is by this method we know that it was the gunshot which killed him: for he was in the fulness of life immediately before, all circumstances being the same, except the wound."²

(3.) "All inference is from particulars to particulars: General propositions are merely registers of such inferences already made, and short formulæ for making more."³

(4.) "For the purposes of the present inquiry, Induction may be defined, the operation of discovering and proving general propositions. It is true that (as already shown) the process of indirectly ascertaining individual facts is as truly inductive as that by which we establish general truths. But it is not a different kind of induction; it is a form of the very same process: since, on the one hand, generals are but collections of particulars, definite in kind but indefinite in

¹ Bk. II. ch. iii. § 7.

² Bk. III. ch. viii. § 1 and 2.

³ Bk. II. ch. iii. § 4.

number; and on the other hand, whenever the evidence which we derive from observation of known cases justifies us in drawing an inference respecting even one unknown case, we should on the same evidence be justified in drawing a similar inference with respect to a whole class of cases. The inference either does not hold at all, or it holds in all cases of a certain description; in all cases which, in certain definable respects, resemble those we have observed.”¹

(5.) “Induction, properly so called, as distinguished from those mental operations, sometimes though improperly designated by the name, which I have attempted in the preceding chapter to characterise, may, then, be summarily defined as Generalisation from Experience. It consists in inferring from some individual instances in which a phenomenon is observed to occur, that it occurs in all instances of a certain class; namely, in all which *resemble* the former, in what are regarded as the material circumstances.

“In what way the material circumstances are to be distinguished from those which are immaterial, or why some of the circumstances are material and others not so, we are not yet ready to point out. We must first observe that there is a principle implied in the very statement of what Induction is; an assumption with regard to the course of nature and the order of the universe; namely, that there are such things in nature as parallel cases; that what happens once will, under a sufficient degree of similarity of circumstances, happen again, and not only again, but as often as the same circumstances recur. This, I say, is an assumption involved in every case of induction. And if we consult the actual course of nature, we find that the assumption is warranted. The universe, so far as known to us, is so constituted, that whatever is true in any one case, is true in all cases of a certain description; the only

¹ Bk. III. ch. i. § 2.

difficulty is, to find what description. This universal fact, which is our warrant for all inferences from experience, has been described by different philosophers in different forms of language; that the course of nature is uniform; that the universe is governed by general laws; and the like."¹

(6.) "According to this language, every well-grounded inductive generalisation is either a law of nature or a result of laws of nature, capable, if those laws are known, of being predicted from them. And the problem of Inductive Logic may be summed up in two questions: how to ascertain the laws of nature; and how, after having ascertained them, to follow them into their results."²

(7.) "If these remarks are just; if the principles and rules of inference are the same whether we infer general propositions or individual facts; it follows that a complete logic of the sciences would be also a complete logic of practical business and common life. Since there is no case of legitimate inference from experience, in which the conclusion may not legitimately be a general proposition, an analysis of the process by which general truths are arrived at is virtually an analysis of all induction whatever. Whether we are inquiring into a scientific principle or into an individual fact, and whether we proceed by experiment or by ratiocination, every step in the train of inferences is essentially inductive, and the legitimacy of the induction depends in both cases on the same conditions.

"True it is that in the case of the practical inquirer, who is endeavouring to ascertain facts not for the purposes of science but for those of business, such, for instance, as the advocate or the judge, the chief difficulty is one in which the principles of induction will afford him no assistance. It lies not in making his inductions, but in the selection

¹ Bk. III. ch. iii. § 1.

² Bk. III. ch. iv. § 1.

of them ; in choosing from among all general propositions ascertained to be true, those which furnish marks by which he may trace whether the given subject possesses or not the predicate in question. In arguing a doubtful question of fact before a jury, the general propositions or principles to which the advocate appeals are mostly, in themselves, sufficiently trite, and assented to as soon as stated : his skill lies in bringing his case under those propositions or principles ; in calling to mind such of the known or received maxims of probability as admit of application to the case in hand, and selecting from among them those best adapted to his object. Success is here dependent on natural or acquired sagacity, aided by knowledge of the particular subject and of subjects allied with it. Invention, though it can be cultivated, cannot be reduced to rule ; there is no science which will enable a man to bethink himself of that which will suit his purpose. . . .

“We shall fall into no error, then, if, in treating of Induction, we limit our attention to the establishment of general propositions. The principles and rules of Induction as directed to this end, are the principles and rules of all Induction ; and the logic of Science is the universal Logic, applicable to all inquiries in which man can engage.”¹

(8.) “As we can ascertain whether a man was murdered or died a natural death from the indications exhibited by the corpse, the presence or absence of signs of struggling on the ground or on the adjacent objects, the marks of blood, the footsteps of the supposed murderers, and so on, proceeding throughout on uniformities ascertained by a perfect induction without any mixture of hypothesis, so if we find, on and beneath the surface of our planet, masses exactly similar to deposits from water, or to results of the cooling of matter melted by fire, we may justly conclude that

. ¹ Bk. III. ch. i. § 2.

such has been their origin; and if the effects, though similar in kind, are on a far larger scale than any which are now produced, we may rationally and without hypothesis conclude, either that the causes existed formerly with greater intensity, or that they have operated during an enormous length of time."¹ Let us now, in the two following sections, make some examination of the foregoing statements.

IV. On the discrepancy between (1) and (2), on the referring to one universal type both inference from a number of similars and inference from two dissimilars, it is not necessary to comment. The inconsistency or contradiction is too apparent. On the discrepancy, however, between (3) and (4), consisting in making induction mean, now an inference to a particular conclusion, now an inference to an abstract or general conclusion, some few remarks seem to be called for.

Let us consider the conclusion to be drawn from the premises, stated by Mill, "My father, and my father's father, A, B, C, and an indefinite number of other persons, were mortal."² Let us consider it in the light of the two passages now under comparison. He tells us, that general propositions are collections of particulars, registers of inferences already made; and he also tells us, that the same evidence that justifies an inference concerning one particular justifies an inference concerning a whole class. A general proposition, then, may be arrived at by means of a summation of particular inferences; or it may be arrived at instead of a particular inference from the same premises.

Now there appears to be, here and elsewhere, a confusion between two kinds of general proposition, between an abstract proposition such as, Any man is mortal, and a universal proposition such as, All men are mortal. In a passage connected with the statement of premises given

¹ Bk. III. ch. xiv. § 7.

² Bk. II. ch. iii. § 6.

above, and quoted at the beginning of our last chapter, Mill apparently seeks to show that, when an argument—ending in the conclusion, *X is mortal*—is expressed in syllogistic form, the major premise, *All men are mortal*, is a proposition derived from a number of particular conclusions—such as, *Socrates is mortal*—to which the original premises, *My father and the rest are mortal*, have led. It is derived from the particular conclusion, *Socrates, resembling my father and the rest, is mortal*, together with all possible similar conclusions supposed to be made; summing them all up in one short collective formula.

But, having thus exhibited the major premise of the syllogism as a universal drawn from—and therefore of course including—all similar particular propositions, he proceeds to treat it as an abstract proposition, not embracing, but only being typical of, particular conclusions that may at any time be drawn by means of it. He proceeds to speak of new particular conclusions, not as being included in the formula, but as being drawn from the original premises according to it; as if the formula, or major premise of the syllogism, were, not, *All men are mortal*, but, *Any man is mortal*. And that this is the view which he prefers to take of the general proposition seems to be sufficiently clear from other evidence. For instance, he remarks in a foot-note—“The language of ratiocination would, I think, be brought into closer agreement with the real nature of the process if the general propositions employed in reasoning, instead of being in the form *All men are mortal*, or *Every man is mortal*, were expressed in the form *Any man is mortal*.”¹ And the general propositions which he holds it to be the business of induction to discover are put before us as laws of nature, having presumably, as such, their proper expression in abstract form.

¹ Bk. II. ch. iii. § 5.

Here, then, the question arises, Whence comes the abstract proposition? If inference is from particulars to particulars, and if the general proposition is a universal one, summing up particular conclusions, it may not improperly be regarded as virtually contained in any particular conclusion, and so belonging to the same type of inference. If, however, it is an abstract proposition or formula, according to which particular conclusions may be drawn, whence is it itself inferred? In the foot-note from which a sentence has just been quoted Mill continues: "This mode of expression, exhibiting as the type of all reasoning from experience, 'The men A, B, C, &c., are so and so, therefore *any* man is so and so,' would much better manifest the true idea—that inductive reasoning is always, at bottom, inference from particulars to particulars, and that the whole function of general propositions in reasoning is to vouch for the legitimacy of such inferences." He perhaps implies by this, that an abstract conclusion is but a special kind of particular conclusion. But surely such a strained interpretation of particular, as including abstract, would be inconsistent with his statement, already quoted, that the universal type of reasoning leads to the conclusion that an individual or individuals have a given attribute.

That from the same premises the mind can and does infer both particular propositions such as, Socrates is mortal, and abstract propositions such as, Any man is mortal, is doubtless true. What is here contended, in opposition to Mill, is that the two inferences do not belong to a single universal type. It is contended that, after the mind has discovered manhood to be a cause of the mortality of A, B, C, and the rest, it does not pass necessarily and spontaneously to one only and universal type of further conclusion; but it starts afresh in either one of two directions according to its choice, following the case of Socrates, or following the case of

abstract man. It is contended that this movement cannot—if only because it may be in either one of two directions—properly be merged in that of the discovery of the cause of the mortality of A, B, C, but requires to be treated of as a separate piece of inference. The doctrine—it is thus contended—that there is but one universal type, here breaks down. For there is one process of inference from effect to cause in exclusive relation to the given particulars, and another process, manifestly different in kind, on to a further particular or to the abstract case.

V. The thing to be commented upon in this concluding section is Mill's fallacious endeavour to bring within the scope of his methods and canons all inference whatsoever. We have just been noticing the want of unity in the processes he speaks of, and we have now to notice the absence of completeness. There is a whole field of inferences which his treatise does nothing, or almost nothing, to explain.

The passage numbered (5) in the above selection states clearly and correctly the dependence of what he treats of as induction—viz., the ascertaining laws of nature—upon the principle of uniformity of nature. The assumption is made, that the phenomena we deal with are, in so far as we deal with them, precisely similar to others, and that they exist in nature in indefinite numbers.

But, in looking at passages (6), (7), and (8), we find Mill claiming for induction that it extends far beyond the field of similar and indefinitely numerous phenomena. We find him assuming that inductive processes include following laws of nature into their results; that received maxims of probability are among the general propositions whose results require to be followed; that it is from the results of laws of nature, or of maxims of probability, that the truth concerning unique events of common life is naturally determined; that the determining the truth about complicated and unique

events of human life is a process of the same character as determining the truth about physical phenomena.

Now it must be most strenuously denied, first, that particular facts of human life, facts concrete and unique, can be reached by a process essentially similar to that which establishes laws of nature ; and secondly, that they can be reached through the instrumentality of laws of nature already ascertained. And it may be no less strenuously denied, first, that maxims of probability are commonly arrived at by the same mental process as laws of nature ; and secondly, that the truth concerning facts of human life is commonly determined by means of such maxims. With regard to the contention, that "a complete logic of the sciences would be also a complete logic of practical business and common life," we may put two kinds of question. Where, we may ask, is the general truth which, as an outcome of the same premises, corresponds to the particular truth, Julius Cæsar was slain in the Senate House at Rome ? And what possible combination of ascertained laws of nature will lead to the conclusion, Brutus was one of his assassins ? A faint attempt Mill does indeed make later on to show that concurrent testimony and circumstantial evidence lead to proof through the medium of approximate generalisations. But we shall see, in discussing the subject of probability, how far he is from establishing his position. We shall see that he quite fails to show, either that the kind of argument which he indicates is a kind of induction, or that it leads to the establishment of fact.

More evidence might be adduced of his elastic application of the term induction. Enough, however, has been said for the purpose of our argument. The point which it is here desired to insist on is this : particulars manifestly more or less unique are fallaciously classed with particulars that have their counterparts ; and all inference from them and to them

is quietly assumed to be virtually included in the inductive process of ascertaining laws of nature.

Thus it happens, that in Mill's treatise a very large part of the inference which we employ in the common affairs of daily life is not merely practically disregarded, but is wrongfully deprived of its claim to be depended on. Treat the phenomena of daily life—so he seems to say—in accordance with the methods of induction set forth by me, and you will make inferences upon which you may rely: if, however, you draw conclusions that do not admit of being tested by the canons, they are conclusions which, not being true inductions, are unworthy of being implicitly received.

It is the contention of this book—in opposition to the view entertained by Mill—that there is a large class of true and valid inferences which cannot possibly be made after the methods employed for the discovery of laws of nature. It is contended that, besides induction and deduction, there are two other legitimate kinds of inference, which are being more or less continually employed, which lead to conclusions that are often worthy of the utmost credence, and one of which—illation—has great need of being explained and vindicated. And a serious attempt will now be made, in the chapters following, to exhibit the real nature of this kind of inference, and to show how it is worthy of being ranked with induction as a reliable process of passing from the known to the unknown.

CHAPTER VIII.

THE TWO FIELDS OF INVESTIGATION.

I. THERE are, apparently, two quite distinct ways in which it is natural for the human mind to set about the work of investigating at first hand the cause or the effect of any phenomenon that excites its interest. By investigating, let it be briefly said, is here meant seeking to ascertain by means of inference that which is not itself apparent through the senses; and by investigating at first hand is meant seeking to ascertain by means of inference other than deduction. There are pairs of phenomena—as, for example, the sun shining in the heavens, and a heated atmosphere surrounding us—which appear to be directly apprehended as cause and effect through the instrumentality of sense. And there are pairs of phenomena—as, for example, the vertical position of the sun in tropical latitudes, and the extremely high temperature of these latitudes—which we may conclude to be causally related by means of deductive inference from our own previous knowledge. But besides these two ways of becoming acquainted with causes and effects there appear to be two others. In the vast number of cases in which sense is no direct guide to the cause or effect of any phenomenon that comes before us, and in which, again, we have no knowledge, enabling us to make a deductive inference, of the cause or effect of any similar phenomenon, there are still two ways in

which it may be possible for the mind to proceed to the discovery of a cause or an effect. Besides deduction, the mind has two distinct ways of thus passing from the known to the unknown; it is able to employ, when circumstances admit of it, either one of two kinds of inference, each of them distinct from deduction, and yet not more distinct from it than they are from one another.

Before speaking more particularly of the difference between these two kinds of inference—induction, already treated of, and illation, about to be treated of—something must be said concerning the conditions of their employment. They appear to belong respectively to two distinct fields of investigation. Induction, together with deduction, belongs to one field; and illation, together with delation (a kind of inference not concerned with the discovery of causes and effects), belongs to the other. Let us consider what the two fields are.

In dealing with particular phenomena, whose causes or effects we are in search of, we seem inevitably to refer them, with more or less consciousness and deliberateness, to one or the other of two distinct classes or collections. Every effect together with its at present hidden cause, and every cause together with its at present unknown effect, is regarded by us, either as constituting one of the innumerable manifestations of the orderly and settled course of nature, or as constituting a part of one of the innumerable groups of particular events which make up the drama of human life. It is looked upon, either as exemplifying and having its explanation in some general law, or as occupying its own particular position in the circumstances of some definite time and place. Either we see in it a member of a class containing other combinations of cause and effect precisely similar to itself, or we treat it as a junction of compound cause with compound effect which is not other than special

and unique. In the one case it becomes an object with us to add to our store of knowledge of natural laws having more than a single application; in the other case we strive to fill in or extend that mental picture of the world in which we see particular incidents historically linked together as causes and effects. In other words, the mind, in its investigation of causes and effects, conducts its inquiries at one time in the field of natural law, at another time in the field of history. To some persons the former kind of mental activity, to others the latter, appears to be the more congenial; but both kinds seem to be, in greater or less degree, habitually engaged in and pursued by all.

Let us notice briefly a few instances of the mind's referring phenomena which excite its interest and curiosity to one or the other of the aforesaid fields. Let us suppose a person to be instituting inquiry as to the cause of (1) the unhealthy appearance of some common shrub met with in a walk, (2) the dark complexion of a native of India whom he has seen, (3) a friend of his having been seen riding on a beautiful horse, (4) some fruit being found one morning lying on the ground in his orchard. Is it not sufficiently clear, that in the two former cases the mind is likely to betake itself, so to speak, to the field of natural law, and there carry on its investigations; while in the two latter cases it will move in the field of special events linked together, that is, in the field of history? The person in question would naturally—so it seems—look for a cause of the unhealthiness of the shrub such as might be found similarly manifesting itself in other shrubs; and for a cause of the dark complexion of the Indian such as might be seen to have operated similarly in the case of other natives of the same country. On the other hand, he would endeavour to find an explanation of his friend's being seen on the back of a beautiful horse, as also of the ground of his orchard being

strewn with fruit, in some definite group of circumstances and events having elsewhere no exact counterpart.

In like manner phenomena seem to be referred by the mind either to the field of natural law, or to the field of history, when, instead of their causes, it is their effects that are being sought. Thus to the field of natural law would be assigned the causal phenomenon of treating a strawberry-bed with some particular dressing, when there are other beds, besides itself, that are subjected to the same treatment. And to this field would belong the trying some particular fly to fish for trout, when there are other anglers, besides the one, also making use of it. The effect looked for, whether of the dressing or of using the particular fly, is an effect such as shall be apparent elsewhere than in one particular bed of strawberries or in one particular angler's creel. It is, in each case, an effect which shall be understood to follow from the operation of some natural law. On the other hand, it is the field of history in which the mind works, when a meteorologist, having noticed the state of the barometer, seeks to ascertain the effect of the causes whose presence is here indicated on some particular person or some particular undertaking, in whom or in which he is interested, on the given day. And it is in the same field that an answer must be looked for by one who would know what has been the effect upon his own life of giving his son a university education. The influence of the weather upon the particular person or undertaking, and the attitude and relation of the young man to his father, constitute more or less unique phenomena, which must be regarded as special combinations of effects, combinations whose exact counterparts are not to be found elsewhere.

II. The two fields of investigation, although from one another quite distinct, are nevertheless so far connected that a relation of causation established in either of them

may be, in a manner, transferred to the other, and there regarded as a true relation. If, on the one hand, it can be said to be natural for a certain particular phenomenon to have been caused by, or to have produced, another, then, in a certain true though restricted sense, it is a matter of history that it has been caused by, or has produced, the other. And if, on the other hand, it is known as a historical fact that a certain particular phenomenon has proceeded from, or has produced, another, then it may be affirmed to be somehow in accordance with a law or laws of nature that the one should proceed from, or should produce, the other. If, for example, we discover that the unhealthy appearance of a certain shrub is such as is naturally due to frost, then we may pronounce it to be a historical fact that at some time and in some degree frost has been encountered by it. Or if we learn that it is natural for a certain Indian to have a dark complexion, as being a native of a tropical country, then we may also realise that it forms a part of his individual history that the circumstances of his birth were such as to produce some degree of darkness in his skin. Again, if we should hear, as a matter of fact, that certain meteorological causes were followed by weather favourable or unfavourable to some particular person or undertaking, we may safely say that this result was brought about only in accordance with laws of nature. And if we have reason to conclude that in certain given circumstances the sending a young man to the university has produced such and such results upon his father's life, we may be satisfied that somehow it is only natural that these results should be produced.

But it is only in a manner, only, that is, under certain reservations or restrictions, that the mind can transfer relations of causation, when it does transfer them, from one field to the other. The question, what these reserva-

tions or restrictions are, will be noticed almost immediately. It may first be pointed out—this section being thus brought to a close—that the field in which the mind of any individual thinker more naturally and spontaneously works is determined, partly by the objective character of the phenomenon whose cause or effect it desires to investigate, and partly by its own subjective bent. There are, on the one hand, phenomena which seem more especially to appeal to the senses and understanding as resembling others; and there are, on the other hand, phenomena which seem more especially to strike men as unique. Every phenomenon no doubt has, in greater or in less degree, each of these two characteristics; but in some, resemblance to others is more prominent than diversity, in some, diversity from others is more conspicuous than resemblance. And according to the characteristic which seems to prevail does the mind naturally tend to fix upon the field of natural law, or upon the field of history, as that in which investigation must be carried on. For example, the application of a particular dressing to a strawberry-bed, supposed by no means to be confined to a single experiment, is, as a cause whose effect is sought, spontaneously referred by the mind to the field of natural law; while the fact of a particular person, whose poor circumstances in the past are well known, being seen mounted on a beautiful horse is referred, for the ascertainment of the cause of this unique event, to the field of history.

But there also appear to be many phenomena with regard to which, since neither resemblance to nor diversity from others is especially manifest, the mind is fully at liberty to choose into which of the two fields it will conduct them for purposes of investigation. If, for instance, a person would ascertain the cause of his feeling unwell on a particular day, it may be open to him to enter upon the inquiry,

either as one that belongs to the domain of natural law, or as one that concerns only his own private history. Either he may look upon his uneasiness as a symptom belonging to a class the members of which proceed each from a common or similar cause; or he may treat it as one of a group of symptoms and circumstances affecting himself alone, and proceeding from some common or joint cause. So again, if he desires to estimate the effect upon his own health of having adopted a particular regimen, either he may search for some common change wrought in the physical condition of himself and of others who likewise have adopted it, thus carrying on his inquiry in the field of natural law; or he may hope to draw a conclusion from his intimate acquaintance with the special conditions of his own body, conducting his investigation in the field of history. As the result of the one method of proceeding, he acquires some additional knowledge of the general physiological principles upon which nature works; as the result of the other, he arrives at a fuller understanding of the particular picture of the human constitution which, in his own person, she presents to his view. In which of the two fields the mind determines to conduct such inquiries, or, in other words, which of the two kinds of information it resolves to search for, seems to be dependent upon its own general or temporary subjective bent.

III. It was suggested near the beginning of this chapter, that each of the two fields has its own kinds of inference. And it has just been suggested in the preceding section, that a relation of causation established in either field—of course, by a kind of inference peculiar to that field—can only be affirmed in the other under certain reservations or restrictions. It will now be our purpose to consider what these reservations or restrictions are. An endeavour will be made to show, how a relation of causation established

in the field of natural law necessarily fails to be an adequate representation of any similar relation in the field of history; or, in other words, how a historical fact cannot really be inferred by the mental processes that appertain to the field of natural law. The converse truth—that a relation of causation established in the field of history fails to be an adequate representation of any similar relation in the field of natural law; or, in other words, that a law of nature cannot really be inferred by the mental process that appertains to the field of history—it will not be necessary to consider. For the main purpose of this chapter, in insisting on the distinction between the two fields of investigation with their corresponding kinds of inference, is to vindicate the claim of the latter field together with its special kind of inference to equal recognition with the former. While, therefore, the insufficiency of investigation carried on in the field of natural law to establish causal relations in the field of history must be exhibited in order to this end, there is no similar ground for dwelling upon the converse truth. Moreover, we are not yet in a position to discuss it, since we have not yet become acquainted with illation, the method of discovering causes and effects in the field of history. And it may be further added, that the truth in question will to some extent incidentally disclose itself, as we become familiar with operations in the field of history.

The essential characteristic of any phenomenon placed by the mind for purposes of investigation in the field of natural law is, that it has, or may have, exact counterparts of itself existing elsewhere in nature. The particular B whose cause, or the particular A whose effect, we purpose to ascertain is at once assumed to be precisely similar to other B's, or other A's. The cause of this particular B—so we argue—is a kind of cause such as is assignable in common to all other B's.

The actual or possible fact of the existence elsewhere of others exactly like it is an essential part of our conception of the phenomenon before us. It is distinctly apprehended as not singular, not unique; it is conceived of as one of a family or group of phenomena all of which are identically alike.

Now phenomena, as they are made known to us through our senses—phenomena, as we have actual experience of them—do not appear to satisfy the primary condition, just described, of inductive investigation in the field of natural law. It would seem to be the case, that we are by no means entitled to say of any phenomenon, as it actually presents itself to us, that its exact counterpart does exist or can exist anywhere in nature. No mouthful of food can be said, in every particular of touch and taste, to be exactly similar to any other; no peal of thunder can be said, in respect of every one of the conditions under which it strikes the ear, to have or to have had its exact counterpart elsewhere; no human form can be said, in every circumstance of feature and expression, to bear an exact resemblance to any other. The constituent elements which make up phenomena of any given kind are, it would seem, so multitudinous, and the number of possible combinations of these elements—in other words, the number of conceivable phenomena of the given kind—so indefinitely large, that in no case whatsoever is the mind justified in pronouncing, that between any two phenomena, apparently similar, the resemblance is in all respects exact.

And yet, in proceeding by induction in the field of natural law, the mind certainly does deal with phenomena as if it were assured of exact resemblance between them and others. Wherein, then, is to be found the explanation of this seemingly irrational and futile course? Apparently it is to be found in this circumstance—that the mind has the power of

discerning and abstracting common or precisely similar elements which enter into the composition of diverse phenomena. Among the sensations felt by the palate in eating apples of different sorts and at different times it can lay hold upon one set which is invariably present, and designate this the taste of apple. In all various instances of peal and crash echoing through the heavens it can detect the presence of one common type of sound, which it knows as thunder. Beneath all diversities of lineament it can see in every face certain common attributes, which constitute it the face of man, woman, or child. In some such way as the chemist is able to abstract or separate the oxygen of the atmosphere from the other elements, in conjunction with which alone it is known to ordinary men, the mind can abstract and separate for its own further use certain parts of any phenomenon that appeals to it through the channels of sense. And since allied phenomena, though in no case themselves identically similar, must have among their constituent elements some that are identically similar, the mind, abstracting certain of these elements from one phenomenon, searches for and finds in another their exact counterparts.

The phenomena, then, with which the mind deals in the field of natural law are not real phenomena, but abstractions. They are to a certain extent its own creations. They are not the things, but only abstract portions of the things, of which it becomes cognisant through the medium of sense. Regarded as being themselves things, they have existence for the mind alone.

IV. Again, in the case of a phenomenon dealt with by the process of induction, not only must it be conceived of as having actual or possible counterparts elsewhere, but also it and its counterparts must be distinctly recognisable by the mind. Pronouncing of any phenomenon, whose cause or effect we wish to ascertain, that it bears an exact resem-

blance to other actual or possible phenomena, we draw, deductively, the conclusion that, whatever the cause or effect of the one may be, those of the others must be identically similar. And we seek, by comparing or contrasting sets of circumstances, to find a residuum which, being present as antecedent or as consequent in all the sets in which an instance of the phenomenon is wholly present, or absent from all those from which an instance happens to be wholly absent, shall be or shall contain the cause or the effect required.

The process, it will be observed, whether conducted by the method of comparison or by the method of contrast, is essentially dependent upon our having such full cognisance of the similar phenomena with which we deal, as to be able to say of any one, either that it is wholly present among, or else that it is wholly absent from, any set of circumstances of which we make use. The mind, when working in the field of natural law, forms an abstract image or picture of each of the phenomena with which it deals; and it is through recognition of the presence, or the absence, here and there, of the counterpart of such picture that inductive inference is carried on.

It thus comes to pass that in another way the phenomena of the field of natural law are not real phenomena. They are phenomena isolated by the mind from all others, and apprehended by it only in their individuality. All the particular circumstances which, though not forming an actual part of any given effect or cause, nevertheless stand in obvious relations of time and place to it, and with it appeal to the mind through the senses as a compound historical event—all these circumstances are ignored. Thus here again it may be said that the mind is dealing, not with real phenomena, but with abstractions. For a thing regarded only in its individuality, as being just what in itself it is, and as not

being anything else than just what in itself it is, seems in truth to be but an abstraction. It seems to be to a certain extent a creation of the mind, not a thing made known to it by the experience of sense. Not only is it the case, that we have no experience of any phenomenon devoid of touches peculiar to itself, and precisely similar to some other; but also it is the case, that we have no experience of any phenomenon entirely independent of its surroundings, and capable of being adequately apprehended without reference to them. Things, as we know them, are not complete in themselves and self-contained. Individuality is but a special kind of abstraction.

Phenomena being thus dealt with in the field of natural law as abstract and individual, it will not be difficult to see that inference by induction must be wholly insufficient to establish historical conclusions. A causal relation between two phenomena, transferred from the field of natural law and interpretable only under the reservations or restrictions above described, is not, and cannot be made to be, in any full sense, a causal relation in the field of history. Even the particular proposition, This A is the cause of this B, arrived at by means of induction, although it has the definiteness appropriate to a causal relation in the field of history, is nevertheless far from expressing all that is meant by the same proposition when used to signify a fact properly belonging to this field.

Let us take the two illustrations of transfer from the field of natural law to the field of history given in the second section. The first of these was the case of the unhealthy appearance of a particular shrub being ascertained by induction to be due to frost. If among the antecedents of the phenomenon there is known to be but the one instance of frost, then we are in a position to say, Last night's frost has been the cause of injury to this shrub. And we have before

us what is in a certain sense a fact of history. But let us consider (1) what it is that we are affirming, and (2) what it is that we might or should be affirming had we approached the subject from another side. What we are affirming is this: The abstract part of this shrub, in respect of which it precisely resembles other shrubs, has suffered a certain injury from that abstract part of last night's frost, in respect of which it precisely resembles other frosts. But what we might or should be affirming, were we to begin by regarding the frost and the injury to the shrub in the field of history, is something of this kind: The cold of last night, of which you and I were so painfully conscious, has inflicted an injury upon this shrub, which formed so conspicuous a feature in our garden. In the field of history the frost and the shrub are their full selves, without any abstracting or paring to produce an exact resemblance between them and other phenomena. And yet they are not by themselves, for a material part of the conception of them is their being connected with other phenomena by relations of time or place.

Our second illustration was that of the dark complexion of a certain Indian being due to his being a native of a tropical country. Here we may say that in a certain sense a historical fact is expressed by the definite statement, His Indian birth is the cause of his present dark complexion. But, as before, there is a vast difference between the interpretations that must be put upon the words, accordingly as they are referred to the field of natural law or to the field of history. In the one case the meaning is as follows: His birth in a country possessing, as an abstract constituent of its climate, that which makes it resemble other tropical countries, is the cause of that abstract quality of complexion, in respect of which he resembles other persons whom we call dark. In the other case the meaning is something of this kind: His being a native of that well-known British

dependency, India, is the cause of his having a complexion which attracts so much attention when he walks through the streets of our small town.

It seems, then, to be sufficiently clear that, if we are to draw inferences and establish conclusions in the field of history, we must have some other mode of proceeding than by means of induction. Even if conceivably, by means of exhaustive analysis of concrete phenomena, followed by a correspondingly complete synthesis of ascertained elementary laws of nature, we could acquire an adequate knowledge of causal relations between concrete phenomena in the field of natural law, these relations would nevertheless not be those of the field of history. For, though the phenomena would be concrete, yet the attribute of individuality would still adhere to them.

CHAPTER IX.

CONTINUITY IN NATURE.

I. THE making inferences, or passing from the known to an apprehension of the hitherto unknown, is dependent in the field of history, no less than in the field of natural law, upon the mind's recognition of a certain fundamental principle. Unless the mind is conscious that the new fact, whatever it may be taken or may prove to be, must stand in a certain relation to the old facts, it has no power of forming conclusions respecting it upon the truth of which it can rely. But the fundamental principle of inference, or the necessary relation between new and old, is one thing in the field of natural law, and another in the field of history. Illation is in no way dependent upon that truth of nature which we have seen to be the basis of induction, the truth, namely, that there is a uniformity of relation between causes and effects. But it takes its stand upon a principle which may be said to be allied to it, namely, that there is a continuity in the action, and in the grouping, of natural causes.

What alone makes it possible for the mind to have understanding of the world in which it lives, to have thoughts concerning it other than those which are directly due to the impressions of sense, to get behind phenomena and ascertain something of what they mean, to trace connections between them and regulate action in dependence

on them—what alone appears to make this possible, is the conviction, the innate conviction, that there is an orderly and settled design of nature, of which design phenomena, as they occur, are the expression. Nothing resembling a satisfactory explanation of the mind's action in making itself acquainted with the ways of nature can apparently be given, unless it is assumed as a primary and fundamental fact, that the mind regards the universe as the embodiment of order and intelligent and settled purpose. And it seems to find, constituting part of the order and purpose of nature, besides causation and uniformity in nature, this other fundamental principle: The elemental forces of nature, the first causes—whatever they may be—which give rise to particular phenomena, taken as a whole, remain always substantially unchanged.

This principle of continuity in nature is a necessary condition of our being able to infer the future or the past. That is to say, if we imagine a time when the system of nature can be said to have been, or to be about to be, other than it has been and is within the scope of our experience, the time which we thus imagine is a time the history of which, both general and particular, must be to us a perfect blank. Concerning it we can make no inferences. We know nothing of what phenomenal causes may exist to produce effects, or of what effects there may be that have had their origin in causes. In order to making attempts to understand the world's history, we must be satisfied that it is a world which, during the period over which our investigation ranges, has remained and will remain substantially in harmony with the teachings of our experience. This does not by any means prevent due recognition of development in the action and interaction of elemental forces. The mind demands, not that change shall be entirely absent, but that whatever change there is shall

be orderly and progressive. It demands that the change itself shall be the expression of settled purpose and design.

From this general principle we derive the two following particular results.

1. All such phenomena as we are led to ascribe to elemental forces—or, in other words, to the system of nature—as their source, are phenomena which must for ever remain unchanged, or must change only in the way of orderly development. On the one hand, we have firm assurance that such phenomena as the regular continuity of successive sun-risings, and the gradual maturing of animal and vegetable life, will uninterruptedly proceed. On the other hand, we recognise in nature nothing catastrophic: if catastrophes there should be, it must be from outside the world, which we are learning to understand, that they will come upon us.

2. A phenomenon of a special kind, which we cannot do otherwise than ascribe to the action of elemental forces, is the manner in which causes were originally grouped. Accordingly, the grouping of causes once established is the grouping which we look upon as a continuous feature of nature's order. Any cause continues, subject to the operation of development, to combine with such other sets of causes as it has combined with from the beginning.

Let us suppose a case of concrete L having been always followed, or preceded, by concrete M or by concrete N. Then we know that any new instance of L will be followed, or preceded, by one of M or N. We know this, not, of course, as in the field of natural law, because abstract L is the cause or effect of abstract M or N, but because abstract L is one of a group of causes which have always produced among them either a concrete M or a concrete N, or because it is one of a group of effects which have always been together preceded either by a concrete M or by a

concrete N. If it is concrete L, as a cause, that is being considered, we say that abstract L combines in nature with other causes to form a group, which group is characterised by having either some concrete M or some concrete N as its consequent. If it is concrete L, as an effect, that is under consideration, we say that the cause of abstract L combines in nature with other causes to form a group, which group is always recognisable as an instance either of concrete M or of concrete N.

Similarly, if it is the case that P has always been accompanied either by Q or by R, we judge that any new instance of P will be accompanied either by one of Q or by one of R. We judge, if they are causes, that abstract P will always act in conjunction either with abstract Q or with abstract R; or, if they are effects, that the cause of abstract P will in the future, on any occasion of its acting, join either with the cause of abstract Q or with that of abstract R.

This principle of continuity in nature is not only different from, it is quite independent of, the principle of uniformity in nature. Although it involves, of course, an apprehension of the principle of causation, yet it appears in no way to involve an apprehension of the important corollary just mentioned; just as, for example, the conception of solar light, although involving the conception of the sun, does not involve the further conception of solar heat. In the argument that, because all observed instances of concrete L have produced hitherto the effect M or N, therefore this particular L must produce M or N, there is no reference whatever to similar causes, and consequently no introduction of the principle of uniformity. The reference is not to any similarity between this and other instances of abstract L, regarded as being themselves operating causes, but it is only to a similarity between them, regarded as

being attached to, and lending their name to, various groups of operating causes. It is not at all the abstract L—of which repeated instances occur—whose effect is apprehended as M or N, but it is the groups of causes of which abstract L from time to time constitutes a part. These groups of causes may, for anything the argument requires, be entirely different from one another—except for their containing abstract L—even on occasions producing instances of the same effect M, or the same effect N. The notion of causation made use of seems to be no more than that of certain antecedents, viz., those—whatever they may be—that from time to time include abstract L, producing a certain limited range of observed consequents, M and N. And of this notion of causation the principle of uniformity constitutes no part.

To avoid misconception, it may be well to point out—though the remark has no direct bearing upon the subject before us—that M and N, each sometimes following after or preceding L, must of course contain a common element, which is the unfailing effect or cause of abstract L. With this unfailing effect or cause the mind, when working in the field of history, is not concerned.

II. Let us now devote some further attention to this relation between observed antecedent and observed consequent in the field of history. Upon it depends the possibility of making illative inferences. In order to discover, in the field of history, the exact locality of a required cause or effect, it is necessary that we should be able, from past experience, to mark out certain narrow limits within which the search may reasonably be confined. We call to mind what we know of the kinds of cause which have seemed to lead to effects of a similar kind to the one before us, or of the kinds of effect which have seemed to follow from causes such as that we are considering. And among

possible manifestations of these kinds of cause, or these kinds of effect, we search for a particular one, which shall be the definite cause of the given effect, or the definite effect of the given cause. If, for example, we would ascertain under what particular circumstances a sum of money has disappeared, we start with the general premise, that such disappearances have taken place in one or another of certain kinds of way, kinds of way with which experience has rendered us more or less familiar. We have known money to be stolen, let us say, or we have known it to be accidentally dropped, or we have known it to be put away for safety in some forgotten place. And it is among these alternatives, if anywhere, that, making use of the principle of continuity in nature, we expect to find the solution of the present problem. Money, we say, disappears sometimes through theft, sometimes through carelessness, sometimes through forgotten hiding; consequently it may be expected that in the present instance its disappearance is owing to some manifestation of one of these three kinds of cause.

A technical formula for the sort of knowledge of nature that we employ is, some X is Y . This formula, understood to mean, some X has as its cause or as its effect Y , covers both the case of a concrete effect known to be preceded by several alternative concrete causes, and the case of a concrete cause known to be followed by several alternative concrete effects. Some white hair is human hair, is a proposition expressing results of observation in the one case; Some men have white hair, expresses results of observation in the other. The former means, that some white hair results from, or contains in itself the effects of, attributes and conditions that are found in man; the latter, that some men produce, or contain in themselves the causes of, white human hair. Neither proposition, be it observed,

asserts a relation of causation between whiteness of hair and any essential attribute of man. On the contrary, it may be almost said that such a relation is implicitly denied; since, if it were supposed to exist, the employment of the word "some" would be inappropriate. In saying, Some men have white hair, we affirm that with the essential attributes of manhood are sometimes conjoined other causes, the effect of the whole being the concrete white hair of particular persons. And the statement, Some white hair is seen in men, is equivalent to the assertion that the causes of white hair in the abstract are sometimes joined to other causes and conditions, the combination being recognisable as a concrete instance of humanity.

We have, then, in the premises of illative inference no ascertained laws of nature, no fixed relations between definite cause and definite effect; but only the results of our observation of the ways in which combinations of causes exist in nature. Causes of concrete manifestations of white hair, whatever these causes may be, are observed to exist sometimes among the attributes and conditions of concrete manhood:—humanity may exist without them, and they likewise may exist elsewhere. Not a reasoned knowledge of the causal ideas of nature, but some practical acquaintance with her intermixture of ideas, is what we profess when in the field of history we make the assertion that, some X is Y. We have obtained glimpses of the sort of company among which she places, from time to time, the causes—if we are seeking for causes—or causes producing the effects—if we are seeking for effects—which we are anxious to discover. And this kind of knowledge, limited and superficial though it may seem to be, is adequate for the purpose of drawing inferences by the method of illation.

CHAPTER X.

DELATION.

I. IT has already been explained of the term 'delation' that it is introduced into this book, partly for reasons of etymology, partly because no better appears to be available. It is employed to signify a kind of inference which is the companion of illation in the field of history, and stands to it in much the same relation as deduction to induction in the field of natural law.

As deduction is a recognition of the fact that there is uniformity in nature, so delation is a recognition of the fact that there is continuity in nature. It consists in arriving at knowledge of a future or a past event by means of the consideration, that the causes or forces of nature operate continuously with such regularity and in such conjunctions as have been manifested throughout the range of our experience. The exactness of the inference may, of course, be to some extent impaired by allowance made for development in nature.

Whatever may be the number of particular classes of conclusion which the mind draws, or is entitled to draw, in the light of the above general consideration, there seem to be only two to which it is necessary for us to devote attention. They are as follows. First, a phenomenon known by experience to take place, or a cause known by experience to operate, after certain intervals of time may be expected

to take place, or to operate, always at the expiration of these intervals. Secondly, a phenomenon known by experience to be always accompanied, or followed, or preceded by one of several alternatives may be expected, on any recurrence of it, to be accompanied, or to be followed, or to have been preceded by one of these alternatives. Whatever other kinds, besides these, of specific conclusion may properly be drawn, the mind does not seem, for practical purposes, commonly to avail itself of its power of drawing them.

But here some explanatory remarks require to be made, with special reference to the final section of Chapter VI. If it be affirmed of the conclusion, A phenomenon hitherto followed by one of several alternatives will continue to be so followed, that it is one proper to be drawn, it can, perhaps, scarcely be denied that the mind is equally entitled to draw the conclusion, A phenomenon hitherto followed by one invariable consequent will continue to be followed by this consequent. For it seems at first sight to be a reasonable view, either that the former position is derived from the latter, or that the latter is derivable from the former. A phenomenon followed by one of several defined alternative consequents may seem to be a special case of a phenomenon followed by one invariable consequent; or a phenomenon followed by one invariable consequent may seem to be a special case of a phenomenon followed by one of several defined alternative consequents. Is the mind, then, entitled, is the mind able, to infer such conclusions as, Any man is mortal, Any bird builds a nest, by delation, in the field of history? Is it possible that Mill is partly justified in his contention, that there is a rude process of generalising, by simple enumeration, which is independent of a knowledge of uniform causation? Is the principle of uniformity in nature, as distinct from that of causation, not essential to an act of generalising?

The question seems to be, not so much what the mind is entitled to do, as what it actually does. Is it ever the case that, when it concludes one phenomenon to be invariably and unconditionally followed by another, it looks upon the cause of the latter, not as being contained in, but only as being bound up with the former? When we say in the field of history, Some men have white hair, we affirm that the cause of white hair is sometimes joined with the essential attributes of manhood. But when it was said, as in the instance given by Mill, All swans are white, was the idea in the mind of the reasoner, that the cause of white plumage is an invariable addition to the nature of a swan? Was it not, rather—according to the view taken in this book—that the invariable cause is contained in the swan's nature, constituting a portion of it?

But, however this may be, the argument against Mill is unaffected. The insuperable difficulty still remains of extracting the principle of universal causation from the given premises. It appears to be no less impossible to derive the conclusion, Any phenomenon has a cause, from such premises as, Any A has bound up with it the cause of B, in the field of history, than it is to derive it from such premises as, Any A is the cause of B, in the field of natural law.

Let us now proceed to consider some particular cases of delation given by Butler in the introduction to his *Analogy of Religion*. The passage from which they are taken will be quoted in a future chapter. He, it must be pointed out, seems to present them as instances of very high probability being practically equivalent to certainty. The view that will be here taken of them is that they are real inferences—inferences, that is, not of something probable, but of something made known—based upon a sure apprehension of continuity in nature.

II. "The observation of the ebb and flow of the tide for ages together gives us a full assurance that it will happen again to-morrow." Whereas one observation—so runs his argument—of this phenomenon affords some sort of presumption that it may recur to-morrow, continuous observation gives rise to firm conviction that it will then recur. He thus appears to look upon certainty as the extreme upward limit of a simple probability. In this case, however, we can scarcely suppose that the mind does really reach, as would seem to be implied, its full assurance by means of successive stages of gradually increasing probability. Its feeling of certainty appears to be referable to a direct recognition of the continuous action of elemental forces. Either we look upon the phenomena of the tides as the immediate outcome of these forces; or, if investigation leads us to attribute the ebb and flow to phenomenal causes, we regard the regularly recurrent action of these causes as a part of the settled order of nature determined by the aforesaid elemental forces.

That the certainty which we feel as to the recurrence to-morrow of the tidal movements is far removed from very high probability, would seem to become more fully apparent when we consider how the case would be, if we had reason to suppose that these movements had, in the ordinary course of nature, been at any time suspended. If with our own eyes we had witnessed the phenomenon ten thousand times, and but once only had marked its absence, though we should still be conscious that the probability of its happening to-morrow was extremely high, yet surely it cannot be said that our expectation would at all amount to full assurance.

III. "No man can make a question but that the sun will rise to-morrow, and be seen, where it is seen at all, in the figure of a circle, and not in that of a square." Of

the proposition that the sun will certainly rise to-morrow—to take this first—it made be said that here also Butler seems to put before us an instance of an extremely high simple probability leading to an admittedly conclusive inference. But the fact appears to be, that it is not at all through considerations of probability that we attain to the assured conviction that the sun will rise, but that we see, either in the phenomenon of sunrise, or else in the regular recurrence of the known causes of the phenomenon, an essential feature of the settled order and course of nature.

Another well-known writer, Cardinal Newman, likewise regards the assurance that we have of to-morrow's sunrise as dependent only on probability. "As to the sun's rising to-morrow," he writes, "there was a first day of the sun's rising, and therefore there may be a last."¹ This remark of his, though true, is scarcely to the point. It is applicable, not to our inferred knowledge of events within the compass of nature's order, but to our ignorance of the length of time for which this order will endure. Inference presupposes the existence and continuance of a settled order of nature; and so far as the order is contemplated as suspended or impaired, so far the power is of course lost of making inferences.

Mill also, we may go on to notice, treats the conviction that the sun will rise as a conviction which, though it is undistinguishable from a feeling of certainty, is nevertheless only a conviction that the event is very highly probable. It will be instructive to consider with some care the nature of his argument. He notes, as we have done, that either sunrise itself, or the phenomenal causes of sunrise, may be the thing whose return we confidently expect to-morrow; his treatment of the two cases being, however, essentially identical. It will be sufficient for our purpose to consider

¹ *Grammar of Assent*, ch. viii. § 1.

only what he says with reference to the latter. He writes as follows.

"On what grounds, it may be asked, do we expect that the sun will rise to-morrow? To-morrow is beyond the limits of time comprehended in our observations. They have extended over some thousands of years past, but they do not include the future. Yet we infer with confidence that the sun will rise to-morrow; and nobody doubts that we are entitled to do so. Let us consider what is the warrant for this confidence.

"In the example in question, we know the causes on which the derivative uniformity depends. They are, the sun giving out light, the earth in a state of rotation and intercepting light. The induction which shows these to be the real causes, and not merely prior effects of a common cause, being complete, the only circumstances which could defeat the derivative law are such as would destroy or counteract one or other of the combined causes. While the causes exist, and are not counteracted, the effect will continue. If they exist and are not counteracted to-morrow, the sun will rise to-morrow.

"Since the causes, namely, the sun and the earth, the one in the state of giving out light, the other in a state of rotation, will exist until something destroys them, all depends on the probabilities of their destruction, or of their counteraction. We know by observation (omitting the inferential proofs of an existence for thousands of ages anterior) that these phenomena have continued for (say) five thousand years. Within that time there has existed no cause sufficient to diminish them appreciably, nor which has counteracted their effect in any appreciable degree. The chance, therefore, that the sun may not rise to-morrow amounts to the chance that some cause, which has not manifested itself in the smallest degree during five thousand years, will exist to-morrow in such intensity as to destroy the sun or the

earth, the sun's light or the earth's rotation, or to produce an immense disturbance in the effect resulting from those causes.

"Now, if such a cause will exist to-morrow, or at any future time, some cause, proximate or remote, of that cause must exist now, and must have existed during the whole of the five thousand years. If, therefore, the sun do not rise to-morrow, it will be because some cause has existed, the effects of which, though during five thousand years they have not amounted to a perceptible quantity, will in one day become overwhelming. Since this cause has not been recognised during such an interval of time by observers stationed on our earth, it must, if it be a single agent, be either one whose effects develop themselves gradually and very slowly, or one which existed in regions beyond our observation, and is now on the point of arriving in our part of the universe. Now all causes which we have experience of act according to laws incompatible with the supposition that their effects, after accumulating so slowly as to be imperceptible for five thousand years, should start into immensity in a single day. No mathematical law of proportion between an effect and the quantity or relations of its cause could produce such contradictory results. The sudden development of an effect of which there was no previous trace always arises from the coming together of several distinct causes not previously conjoined; but if such sudden conjunction is destined to take place, the causes, or *their* causes, must have existed during the entire five thousand years; and their not having once come together during that period shows how rare that particular combination is. We have, therefore, the warrant of a rigid induction for considering it probable, in a degree undistinguishable from certainty, that the known conditions requisite for the sun's rising will exist to-morrow." ¹

¹ Book III. ch. xix. § 2.

The sure conviction entertained by all that the sun, having risen day by day for ages past, will rise as usual again to-morrow, is represented by Mill as an instance of what he terms "the extension of derivative laws to adjacent cases." His view, as described above, of the path followed by the mind in its passage from the known to the unknown does not appear to be in all points tenable. The argument seems to be, (1) that the phenomenal causes of sunrise will continue their action until they are counteracted or destroyed; (2) that, according to all experience, counteracting and destroying causes never spring up suddenly into immensity by mere development; (3) that, if such a cause should at any time arise, it must be in consequence of a conjunction of already existing causes; (4) that such a conjunction has not taken place within the thousands of years that the world has been the object of intelligent human observation; (5) that it is probable in a very high degree that such a conjunction, being thus known to be extremely rare, will not occur to-morrow; (6) that the recognition of this very high probability is a product of induction; (7) that the probability is so high as to be undistinguishable from certainty.

With reference to the above argument, it may be remarked first of all, that Mill, like ourselves, places dependence upon a settled order of nature. But he does not depend upon it to the same extent. He regards it, apparently, as a fundamental truth, needing no argument to prove it, that causes once set going by primeval forces continue to operate according to the law of their being; and in this respect his view may be said to be substantially in harmony with our own. He regards it, moreover, as an accepted fact, however ascertained, that no other single cause will spring up and suddenly arrest them. But he does not, as we do, consider further that the law of their being admits of no

sudden change, in whatever way occasioned. He does not, as we have implicitly done, consider that the law of their being is understood to involve complete immunity from catastrophic disturbance, so long as the present order of things, with which alone investigation is concerned, continues to exist. The position he assumes is this. Regarding it as possible that catastrophic disturbance may occur within the present system of nature through some conjunction of causes, he seeks to show that we have good ground for certainly concluding that it will not occur to-morrow. It has not, he says, happened once in the course of some thousands of years, and is therefore an event which manifestly is extremely rare. Consequently, that it will occur to-morrow, is in the highest degree improbable.

What, now, is the nature and value of this reasoning? What right have we to enunciate this conclusion from the premises laid down? By what course does the mind here travel from the familiar picture of the past to a vision of the unknown to-morrow?

With regard to the sun's having risen daily for five thousand years, either our position is, that in all that time we have known no instance to the contrary, or it is, that in all that time we have known the event to recur continuously. Either our view is, that a certain combination of causes, destructive of sunrise, has never, so far as we are aware, taken place, or it is, that such a combination is known to have never taken place. In the former case, conceiving it to be possible that it may at any time occur, we have no sure ground, perhaps no very strong ground, for concluding that it will not occur to-morrow. For we know nothing of the infrequency with which causes are ordained by nature to combine for the prevention of sunrise, beyond the fact that during the five thousand years there is no evidence of the combination having happened once. It may, on the hypo-

thesis we are considering, be, for anything we know to the contrary, according to the design of nature that to-morrow's sunrise shall not take place. It would be quite in accordance with what we know of the rarity of its being counter-acted, that the counteraction should occur for the first time to-morrow.

If, however, we take our stand on the other hypothesis, and consider ourselves to know positively that for five thousand years the phenomenon of sunrise has on no occasion failed, then the question arises, By what right do we assume it to be possible that in the present constitution of things it should ever fail? Apparently we have no rational justification for making this assumption. If we know that the sun has always risen, then, apparently, we know that it belongs to the constitution of things that it should, as usual, rise to-morrow. We infer, in accordance with our apprehension of continuity in nature, either that the phenomenon, ascribed to the action of elemental forces, will re-appear after the accustomed interval of time, or that the known causes upon which it is dependent will continue to act as hitherto they have acted.

And now, with reference to Mill's assertion that we have the warrant of a rigid induction for concluding that the sun will rise to-morrow, let the question be put, Where is the induction? With reference to his statement that what the induction warrants is a conclusion that is very highly probable, let it be asked, How can a rigid induction issue in a probable conclusion? And with reference to his contention that the probability is so high as to be undistinguishable from certainty, it must be maintained that expectation based, if in this case it could be based, on considerations of probability, would not by any means amount to full assurance.

A word may be said concerning our conviction that the sun will maintain, as hitherto, its circular appearance. The

shape of the sun may, it would seem, be properly regarded as a phenomenon due to the action of the same combined elemental forces which make it in other respects the body that we know. Its shape, in fact, and the other properties which we ascribe to it, constitute together one phenomenon. And we look for a round sun as naturally and necessarily as we look for a sun at all.

IV. "The prince who had always lived in a warm climate naturally concluded that there was no such thing as water becoming hard." In this case, again, the conclusion seems to be derived from an apprehension of continuity in nature. We may, perhaps, look upon it as a negative case of a cause continuing to act as it has always acted. A supposed cause, such as would make water solid, cannot have existence, there being no trace of it within the limits of experience.

The inference thus made involves, of course, two assumptions. It involves the assumption that the conditions affecting water in one portion of the world have been thoroughly observed; and it involves the assumption that these conditions are everywhere substantially the same. The reasoner, assuming that the disposition of causes in the part of nature with which he is acquainted is fully known to him, and that the disposition of them in that part which has not come under his observation is very similar, correctly argues that water can never become solid. But these assumptions are natural and proper only to an intelligence that is very imperfectly developed. With growing experience the observer, while still firmly holding that the disposition of causes in his own corner of the world must continue unchanged, will feel the need of satisfying himself that he has sure ground for knowing what this disposition is. And, while still firmly holding that the disposition of causes in the world as a whole must continue without change, will begin to doubt

whether he has sufficient ground for thinking that this disposition is the same in every part.

A prince, then, with a trained and developed mind would not refuse to believe that water could become solid in another country, unless he felt assured that he had good ground for holding, both that the fluidity of water in his own warm climate had never once been disturbed, and that the forces affecting water in a cooler climate are substantially the equivalents of those affecting it in the warm one.

V. "We conclude that it is supposable there may be frost in England any given day in January next; probable, that there will on some day of the month; and that there is a moral certainty, that is, ground for an expectation, without any doubt of it, in some part or other of the winter." Our special concern here is with the last only of these three conclusions. The others have been quoted in connection with it, because the passage seems clearly to indicate the supposed derivation of certainty from extremely high probability.

Our reason for concluding with full assurance that there will be frost in England on some day during the winter is this: We believe the phenomenon in question to have been continuous in the past. Regarding it as a certain fact that, as winter has succeeded winter throughout the centuries that are gone, frost has invariably made some appearance, we entertain no doubt that in the coming winter it will not for the first time be wholly absent. There seems to be no question whatever of any probability of its appearing or not appearing. There seems to be no such upward passage of the mind, and scarcely a possibility of such a passage, as it appears to be Butler's purpose to put before us; a passage, that is, from the slight probability of frost on a given day in January, through the great probability of frost in

the course of that month, to the certainty of frost before the expiration of the winter.

Nevertheless it may be admitted that there is some plausibility in his view. Would not, it may be objected, probability gradually develop into certainty, were we to suppose the mind travelling northwards from England to the Arctic Regions? and is not the alleged mental passage, from the probability of frost in England on a given day in January to the certainty of it in the course of the winter season, precisely similar to the supposed passage, from the probability of frost on a given day in January in England to the certainty of it in the Arctic Regions?

The answer to these questions seems to be as follows. First, the passage from England to the Arctic Regions is one that we can without much difficulty conceive the mind as undertaking; but the passage from a given day in January, through an ascending series of groups of days, to the complete winter is not an operation which we can at all suppose that the mind does actually engage in. Secondly, if the mind did choose to make the former passage, still the feeling of a certainty thus reached as the extreme limit of probability would not be the same thing as the feeling of certainty which attaches to delative inference. In the one case the feeling would seem to be that, as frost has been known to be absent from England, so it may conceivably have been, and again be, absent from the Arctic Regions on the given day, though experience teaches that such absence has never yet been known. In the other case, that of delative inference, the conviction of the presence of frost appears to be of a distinctly stronger kind. For we do not seem able to conceive, or at all events we do not conceive, even the possibility of its absence.

CHAPTER XI.

ILLATION.

I. AT length we enter definitely upon the important subject of illation, the kind of inference employed in discovering causes and effects in the field of history. The term, it may be explained, has been suggested by Cardinal Newman's use of the phrase "the illative sense" in an allied signification. His doctrine will come under consideration in the following chapter.

Let us suppose that we wish to discover the cause of a real phenomenon ϕ , which presents itself to us as concrete and unique, and at the same time as connected by relations of time and place with other phenomena seen around us. To begin the discussion by repeating all that has been said in previous chapters concerning the multiplicity of causes which contribute to the production of any effect would seem to be unnecessary. It will be understood that the cause of ϕ which it is our object to discover is some one of the indefinite number of causes to which it owes its origin. At the same time it is a cause which, of all this indefinite number, shall lie somewhere in such close proximity to the effect, that the ascertainment of a relation of causation between the two phenomena shall be felt to do something to explain them both. To a person seeking for the cause of a present severe cold, it would generally seem irrelevant to be told—what may, however, be perfectly true

—that it is in a measure due to some small imprudence committed years ago, or to some motive of yesterday which contributed, directly or indirectly, to his going out of doors. What he is looking for is a particular cause which shall be in agreement with his general conception of the kinds of cause which give rise, more or less immediately and directly, to influenza and catarrh, a cause in regard to which he may take precautions against repetitions of it.

To have some clear conception of the different kinds of cause to which effects resembling the phenomenon have hitherto been due—or, in stricter language, of the different kinds of concrete phenomena which have contained the cause of the given kind of effect—is a necessary condition of finding the required definite cause. We must, at starting, be in a position to confine our inquiry within certain narrow limits: illation then may enable us to find, by making search within these limits, a particular cause of the phenomenon before us. We must know, for example, that some p is a , some p is b , some p is c , some p is d . That is to say, we must know that instances of p have sometimes been preceded by a concrete a , sometimes by a concrete b , sometimes by a concrete c , sometimes by a concrete d . We then know, by means of acts of delative inference, that the cause of the new instance of p before us is to be found, if anywhere, among instances of a , or of b , or of c , or of d .

In tracing the cause of an effect p , there appear to be, in general, three distinct steps taken by the mind. All of them, however, may not be necessary on all occasions; nor, when all are taken, need they be always taken in the same order. The steps are (1) that of reducing within the narrowest possible limits the kinds of cause, a , b , c , d , from which p may proceed; (2) that of finding a definite phenomenon, P , which might produce as its effect a manifestation of one of the afore-mentioned kinds of cause, such as a or

c; (3) that of formulating some definite event, *A*, which, being a particular manifestation, say of *a*, shall fulfil the twofold condition of being an explanation both of the known effect *p*, whose cause is sought, and also of the definite cause *P*, known or supposed to be in operation somewhere. This formulated event *A* is the solution of our problem.

The first step, the reduction of the number of kinds of cause amongst which search has to be made, is accomplished by means of regarding *p*, in the first place, as a part of some compound whole; associating with it, in the second place, other effects appearing in some sort of proximity to it; and assuming, in the third place, that some one common or joint cause has produced them all. Let us suppose that we fix upon *q* and *r* as being, with *p*, parts of one whole and presumably springing, with it, from one and the same concrete cause. The immediate problem is then to find a common kind of cause to which all may be attributed. Knowing, as we do, that *p* has had its origin in an *a*, or a *b*, or a *c*, or a *d*, let us suppose that we also know, by means of acts of delative inference, that *q* has sprung from an *a*, or a *b*, or an *e*, or an *f*, and *r* from an *a*, or a *b*, or a *g*, or an *h*. Comparing then the several sets of kinds of cause, we find that, if *p*, *q*, *r* have all been produced by one cause, that cause must belong either to the kind *a* or to the kind *b*.

The step mentioned as the second is that of looking round and fixing tentatively and hypothetically upon a definite cause, *P*, known or supposed to be at work, and ascertaining that it would, according to the teaching of past experience, give rise to a cause of the kind, say *a* or *c*. Two ways may be indicated of satisfying ourselves that we have such a cause before us. We may know, as facts, that *P* is in operation, and that it has in the past produced results of the kind *a* and of the kind *c*. Or we may know, as facts, that certain other effects, *x* and *y*, exist, and that these are cap-

able of being accounted for by the existence of a supposed cause, P , which would naturally produce an a if it did exist.

Having thus found, in the first step, that p has been produced by an a or by a b , and, in the second step, either that a cause certainly exists which might very well produce an a , or that a cause might very well exist which would certainly produce an a , we then, in the third step, put these two results together. We conclude that P , the definite cause known or supposed to exist, has produced a definite action, A , of the kind a ; which action we formulate, and accept it as the required cause of p . The existence of a definite instance of a , connecting together p and P , serves to explain, in the one case, p, q, r, P , in the other case, p, q, r, x, y , all of them definite facts known to have occurred. And thus uniting and explaining a mass of concrete phenomena A is accepted by the mind—more or less confidently and more or less correctly—as a new fact in the field of history.

A fact substantiated in the manner just described, by its power of linking together and throwing light upon other facts of which the mind already has cognisance, is a fact with which it becomes acquainted by means of illative inference. That an event or circumstance can be made to present itself as a more or less obvious feature of some consistent picture, or as a more or less necessary member of some organic whole, is the ground on which the mind takes its stand when, having previous knowledge of the remaining portions of the picture or of the whole, it declares that the event or circumstance wanted to complete it is a fact of history. Of the cogency of the method, the necessity, that is, under which the mind lies of following it to such a conclusion; of the objective value or truth of the conclusion when it is arrived at; and of the mind's action when contradictory conclusions seem to claim acceptance;—of these subjects, which require to be carefully considered, it will be

more convenient to speak in a later chapter. It seems better, instead of entering on them now, that we should confine our attention to mastering the details of the simple process of illation, and wait awhile before discussing further, in these and other respects, the rationale of the mind's action.

We have had before us the process of discovering the cause of a given effect. It will perhaps be well, even at the risk of tediousness, to exhibit the reverse process of investigating the effect of a given cause, before we concern ourselves with illustrations. This question of inference by the method of illation is of so much importance, that it seems desirable to incur the danger of wearying somewhat the general reader, rather than to give the profounder student reason to complain that it has been discussed too slenderly.

We wish, let us say, to ascertain an effect in the field of history of a cause *A* observed to be at work. As before, there appear to be three main steps which it is, in general, necessary for the mind to take. That which may be first mentioned is the operation of reducing within narrow limits the different kinds of effect, *P*, *Q*, *R*, which we have to regard as possibly produced by the given cause. A second is the observing and fixing upon a definite effect *a*, which may have as its cause one of the afore-mentioned kinds of effect, say *P* or *R*. The remaining one is the bringing together *A* and *a* by formulating a particular manifestation, say of *P*, which shall be at once the cause of *a* and the required effect of *A*.

The operation of reducing the kinds of effect, which it is needful to regard as having their origin in *A*, is performed by associating with *A* other observed causes, *B* and *C*, and looking for one joint effect to proceed from all. If it is known that *A* may be followed by an effect of the kind *P*, *Q*, or *R*; *B* by one of the kind *P*, *Q*, or *S*; *C* by one

of the kind P, Q, or T; then we conclude that the joint effect must be of the kind P or Q.

An effect of the kind P or Q, if it has real existence, is in turn a cause producing a further effect. For some phenomenon which may be such a further effect we proceed to make search in the neighbourhood of A. Let us suppose that we become acquainted with a , which may, as we know, have proceeded from a P or from an R.

The mind is then in a position to take the remaining step, which will consist in connecting together A and a by means of some intermediate P. The hypothesis of the actual existence of p , a definite instance of P, proceeding from A and producing a , serves to interpret both A and a , associating them, together with B and C, in one harmonious whole. The mind accordingly pronounces that the required effect of A is p , that special manifestation of P which has produced a . The degree of confidence with which the mind makes its declaration, and the degree of objective truth which enters into it, are questions the discussion of which must for the present be postponed.

II. Let us now, by means of examples, endeavour to realise more fully the twofold method or process that has been described. It will, perhaps, be more satisfactory to make further use of illustrations given in a former chapter, than to introduce for our present purpose others that are altogether new. Let us, therefore, suppose first that we have to investigate the cause to which is attributable (1) a certain person's being seen riding a beautiful horse, (2) a farmer's finding his orchard strewn with fruit.

The first inquiry, it may be noticed, might easily be made with either one of two intentions. It might be made relatively to a certain person's being seen riding, who had not previously been known to indulge in this exercise; or it might be made relatively to his being seen on the back

of a beautiful horse, although he was supposed to be a poor man. The question put might be, How comes he to be on horseback? or it might be, How has he managed to get so good a horse? And according to the nature of the question which it proposes to itself will the mind make choice of suitable phenomena as auxiliary to its investigation. Upon the view which it takes of the phenomenon under consideration will depend its selection of others as presumably having some causal connection with it. Thus in the former case there might be associated with it such facts as these: he has recently taken a house in the country; he is known to have lately consulted a doctor. In the latter case we should make choice of facts of a different description, as, for instance, these: he is now living in an expensive house; an uncle of his who was very well off has recently died.

Dealing with the phenomenon in connection with the former set of facts, we argue in some such way as this. This person's riding may, as we are entitled to infer from our past experience of human action, be attributed, either (1) to a wish to taste the enjoyment that is to be met with, or (2) to a wish to improve his health, or (3) to a wish to associate more closely with a friend in whose company he rides. A new fact in his life, which may be hypothetically supposed to be connected with the new fact of his riding, as an effect proceeding from the same cause, is that he has recently taken a house in the country. Now this effect may be ascribed, either (1) to a wish to benefit his health, or (2) to a wish to benefit the health of his family, or (3) to a wish to associate more closely with his friend, who is also his near neighbour in the country. Putting the two phenomena together, as having one common or joint cause, we conclude that this must be, either (1) a wish to benefit his health, or (2) a wish to associate more closely with his

friend. But another fact, of the nature of a cause, now offers itself to our notice, as possibly containing the explanation of which we are in search. The person in question has, we learn, lately been to a doctor for his advice. This fact, regarded as a cause, might issue, either (1) in a determination to lead an outdoor life for the sake of health, or (2) in the adoption of some other new rule of life. Accordingly, comparing the two possible kinds of common cause of the observed facts of riding and living much in the country with the two possible kinds of effect of the observed fact of consulting a doctor, we find that there is one kind of phenomenon, namely, leading an outdoor life for the sake of health, which may contain among its instances or manifestations both the cause of the riding and the taking a house in the country and the effect of the consultation. And we may formulate one definite instance which will fulfil this double function. We may judge that the cause of the person's being seen on horseback on the given morning was his attending to the advice given by the doctor on the occasion of the visit which he is known to have paid. That the doctor advised him, on a known occasion, to live much in the open air, and that this advice was being attended to on a given morning, is a new fact accepted by the mind, because it links together and explains three observed facts—the person's riding, his taking a house in the country, and his paying a visit to the doctor.

Were we, on the other hand, to take the latter of the two suggested sets of facts, our argument might run thus. This person's opportunity of riding a valuable horse may arise, either (1) from its being lent to him by the wealthy friend with whom he rides, or (2) from unjustifiable extravagance, or (3) from his having come into possession of a considerable sum of money. Another new fact in his life, which may tentatively be regarded as springing from

the same cause as this expensive manner of riding, is that he is now living in a costly house. This latter fact may be due, either (1) to extravagance, or (2) to the possession of large means, or (3) to the supposed necessities of business. If, then, the two effects have in truth a common or joint cause, this must be taken to be, either (1) extravagance, or (2) the possession of large means. But that the person should be in possession of large means is, let us suppose, a very likely circumstance, since a rich uncle of his is known to have lately died. This uncle's wealth might, it is true, have gone elsewhere. But if we suppose it to have been bequeathed, as it well may have been, to his nephew, then we are in possession of a hypothesis which further links together and explains two other facts—the nephew's riding a beautiful horse and his living in an expensive house. Associating the two observed instances of the nephew's contact with wealth with the acquisition by some one of the uncle's property, by means of an inferred intermediate fact—namely, the spending by the nephew of money inherited from the uncle—the mind has before it a historical picture in which facts are consistent with one another and satisfactorily explained.

The second inquiry which we proposed to make was the investigating the cause of a certain farmer finding his orchard strewn one morning with fruit. The cause, he may say, judging from his past experience, is to be found, either (1) in connection with the decay that takes place in the quiet course of nature, or (2) in connection with violence of wind, or (3) in connection with an act of theft. On looking round, he may take note of scattered bits of broken bough, the presence of which seems to negative the first of the three alternatives. Let us now suppose that a boy in the village is found in possession of a number of apples of which he can give no satisfactory account. This fact, taken in con-

junction with the others, seems to indicate that the apples lying on the ground have been left there by pilferers. If next it should appear that the brother of this boy was known to be extremely fond of apples, and to have been guilty on some previous occasion of stealing them, or that having been ill-treated by the owner of the orchard he was likely to wish to do him an injury, we have a cause—namely, a known or supposed motive of the brother—which it seems reasonable to connect with the effects that have been observed. There is a cause—either the boy's fondness for apples and his lax morality, or his ill-treatment by the farmer—which may well have led to the stealing of apples, and there are circumstances—the apples and the bits of tree lying on the ground, and the apples in possession of the boy's brother—which may well have their explanation in an act of theft. Accordingly the inference is made, that the brother of the boy in whose possession the apples were found stole them, leaving others lying about, in consequence of his known fondness for the fruit, or in consequence of his supposed desire to avenge a known act of ill-usage.

III. We pass on to consider examples of the discovery of an effect. And let us, as before, return to illustrations that have been already used. Let us endeavour to follow the process of finding an effect (1) of the meteorological causes whose presence is indicated by a low state of the barometer on some particular morning, (2) of a certain young man's being sent by his father to the university.

In the first case, we may suppose an observer to be aware that the effect of the meteorological causes indicated by the barometer—whatever this effect may be—is of a kind which is included sometimes in heavy falls of rain, sometimes in slight showers, sometimes in violent storms of wind. We may suppose him to examine the aspect of the sky, and to be aware that the causes there indicated produce an

effect—whatever it may be—which sometimes forms part of weather that is thoroughly wet, sometimes of weather in which showers are followed by intervals of sunshine, sometimes of weather that is dull and close. Putting together the two sets of causes, as presumably about to give rise to some joint effect, he may conclude, by means of acts of delative inference, that this effect will be accompanied by rain, whether much or little. He presently hears, let us next suppose, that a friend of his, being on an expedition in the neighbourhood covered by the causes, returned home wetted to the skin. This kind of wetting he knows to be an effect the cause of which—whatever it may be—is found sometimes contained in exposure to heavy rain, sometimes contained in a fall into the water; and he concludes, by means of another act of delative inference, that his friend has suffered one of these misfortunes. By adopting the alternative of exposure to rain he supplies himself, not only with an explanation of his friend's wetting, but also with an explanation of the state of the barometer and the aspect of the sky observed by him in the morning. The hypothesis, that a heavy storm has resulted from the causes indicated and has drenched his friend, links together the state of the barometer, the aspect of the sky, and the wet condition of his friend into one consistent and self-explanatory whole. The observer readily assents to the conclusion, that this storm of rain has taken place, in order to satisfy a twofold need experienced by the mind. This is the need of connecting facts together in relations of causation, and of connecting them in relations that harmonise with its own previous acquaintance with the groupings of causes in the operations of nature.

In the second example, we have to call to mind various alternative effects, more or less commonly observed, of sending a young man to the university. And from among

the many sets or classes of alternatives that might possibly be adduced we must make selection of one set or class, according to the object and purpose with which we start the investigation. Let us suppose, then, that we wish to ascertain an effect of this kind—in what way the relation in which a certain son stands to his father has been brought about by the former having received a university education. We have, accordingly, to place before us such alternative kinds of effect as might make themselves apparent in intercourse between son and father. Some undergraduates, we may say, develop in their university career a taste for quiet study, others for idleness and athletic sports, others for mixing in earnest work with the throng of men. Among these kinds of result we must look for a particular effect produced upon our young man. Let us now suppose that he is known to possess—as a cause co-operating with his university education—a character and temperament such as are commonly seen to lead to active brain-work in connection either with books or with affairs. By reason of this supposition our three alternative kinds of effect or result are reduced to two. If next we may be supposed to learn that the son, having left the university, is living quietly at home in company with a studious father, we may have here a definite circumstance indicative of the effect for which we are making search. For this circumstance may be taken to be a consequence either of a studious habit of mind, or of an indolent desire for quiet ease. If we consider that it springs from a cause of the former kind, then in the definite exhibition which we have before us of this kind of cause, an exhibition which will also be a definite manifestation of one of the alternative kinds of effect produced by the original cause, we have a connecting link between these three things—the original cause, the associated cause, and the observed circumstance. We are thus led to conclude, that the effect of sending the

young man to the university is this: he has contracted a love of study which finds its gratification in the quiet life which we see him leading at home in company with his father.

IV. It will now, perhaps, be worth our while to follow once more the process of illation, in order to compare it step by step with the process of induction. It will be sufficient for this purpose, if we take only the case of ascertaining the cause of a given effect, and if, in considering induction, we look only to the method of comparison. Let us suppose that the problem before us is to satisfy ourselves as to the cause of a certain person being troubled with a bad cold—a problem for which we may find a solution both in the field of natural law and in the field of history. What we desire to have presented to us in the field of natural law is a phenomenon out of which it may not be difficult to conceive the given effect proceeding; and what we desire to see before us in the field of history is a phenomenon which it may not be difficult to associate with the given effect in a single scene of human life.

In either investigation we have to call to our aid other phenomena besides the effect in question. There lies before us a concrete X, compounded of abstract X and other circumstances. According to the field in which our work lies do we make choice of phenomena to be treated in connection with this concrete X. In the one case we look for phenomena which resemble it, in the other for phenomena which may be regarded as parts, with it, of one whole. In the one case, wishing to find a cause of abstract X, regarded as part of the composite phenomenon, concrete X, we collect other instances of concrete X, each of which is looked upon as an envelope containing an abstract X precisely similar to the one already before us. And we argue, from the principle of uniformity in nature, that the

required cause must have its exact counterpart among the antecedents of every instance thus collected. In the other case, our object being to find a cause of our concrete X, regarded as being itself part of a composite phenomenon or collection of phenomena, we treat it in conjunction with other phenomena which presumably belong to the same whole. Our argument, based upon the principle of continuity in nature, then is, that a causal relation or set of relations connecting the phenomena in one whole must present a picture entirely in harmony with other pictures of nature's working already familiar to the observer.

Our choice of phenomena, it may be pointed out, does not appear to be either more arbitrary or more accidental in the latter case than in the former. If the number of phenomena which may be taken as co-elements with concrete X of some whole is indefinitely large, so also is the number of those which may be pronounced to bear some resemblance to it. And if we can very much reduce this latter number by determining in what respect we desire to find resemblance, so also we can very much reduce the former number by determining the exact kind of whole of which we desire to see a completed picture. In the case of a person afflicted with a bad cold, there may be said to be innumerable instances of indisposition resembling the cold in one symptom or another; but, if we look for instances of resemblance in respect of what we consider to be the distinctive features of a cold, the number becomes very greatly lessened. Similarly the number of actions performed and sensations felt by the person having the cold, which are phenomena capable of being taken in conjunction with it as parts of some whole, may be said to be innumerable; but, if we look for actions and sensations that have to do with health only, their number is brought within comparatively narrow limits. Further, it does not appear that there is necessarily any more difficulty in

deciding what phenomena really form parts of the whole which we desire to complete, than in deciding what phenomena are really precisely similar to the one before us. We may, indeed, mistakenly decide that John Smith's having had a hot bath, and his observed loss of appetite, are closely connected with the cold from which he suffers, and may thus follow a path which leads to no satisfactory result. But so also we may mistakenly decide that William Jones, whose symptoms resemble in some respects those of John Smith, is suffering from a cold.

Having fixed upon a limited range of phenomena as suitable for the particular purpose that we have in view, we take instances within this range and consider what information relevant to our purpose we have, or can obtain, concerning them and concerning the original phenomenon. In the field of natural law we ask, What are the antecedent circumstances of these several phenomena? For among the sets of antecedents search has to be made for a kind that is common to them all. In the field of history the question is, What are the special kinds of phenomena which have seemed to be causally connected with those in question in time past? For among the sets of kinds of phenomena search has to be made for a kind that is common to them all. And both the antecedents in the one case, and the kinds of phenomena in the other case, with which we concern ourselves, are, in general, such only as stand in some near relation of time or place to the phenomena under consideration. All remote antecedents, and all distantly connected kinds of phenomena, we pass over as having no practical bearing upon the solution of our problem.

If our object is to ascertain the cause of John Smith's cold, regarded only as a manifestation of the abstract phenomenon, we fix upon a number of other persons likewise suffering from cold, and we set side by side, so to speak, all the

different sets of antecedents, and search among the sets for one which appears in all; confining our attention, however, to recent events that seem to have a bearing upon the health of the bodily organs with which cold is connected. And it may happen that we shall find that all the persons, including John Smith, have lately been subjected in one way or another to unwonted changes of temperature. This being so, unwonted changes of temperature, we more or less confidently conclude, are the cause of the cold from which our friend is suffering. With the particular occasion of his being subjected to them we have no further concern.

If, however, we seek to know a near and concrete cause of a really concrete cold, we proceed in this wise. We fix upon a number of other concrete phenomena presenting themselves in the near neighbourhood of the cold, and apparently capable of being combined with it, by causal connections, in one picture harmonising with our previous knowledge of the grouping of causes. We endeavour to formulate some one historical event which shall be a common or joint cause of the associated effects, and at the same time an effect of an associated cause. Thus we take, let us say, the patient's loss of appetite as an effect presumably proceeding from the same cause as the cold, and his having had a certain hot bath as a remoter cause to which this common cause may be due. The question then is, Can we, consistently with what we already know of nature, fix upon a circumstance or event which is at once the cause of the cold and loss of appetite and the effect of the hot bath? And it may be that we find a satisfactory answer to this question by arriving at the conclusion, that a chill occasioned by taking the particular hot bath is the required cause of the particular bad cold.

The comparison which we have made between induction and illation seems to show that they are quite distinct

mental processes, and yet that in some respects they bear a close resemblance to one another. There is in each the selecting, and invoking the aid of, a group of phenomena which seem to be allied in a special way to the one under consideration. There is in connection with each a preliminary drawing a conclusion or conclusions, by deduction or by delation, in accordance with the fundamental principle of the field in which investigation is being made. There is in each a search made for a kind of phenomenon which shall satisfy the conditions of this conclusion. And there is in each a limiting the range of search to such kinds of phenomena as stand in some near relation of time or place to the given effect. As formal processes of the mind, induction and illation appear to stand on an equal footing in respect of gravity and complexity. A comparison of the processes in point of certainty of conclusions drawn will form a part of our concluding chapter.

Two additional remarks may now be made. The first is that, as in the field of natural law a further deductive step often follows after induction, so in the field of history the result of illation may be carried beyond the ascertainment of the particular cause of a particular effect. While in the former field we can proceed from the proposition, This A is B, to the conclusion, Any A is B, in the latter we can turn the proposition, This A is B, into the conclusion, Some A is B. That is to say, the causal connection found to exist, in the field of history, between a particular A and a particular B is a connection which may be usefully remembered as a new premise in the event of future dealings with an A or with a B.

And the second remark is this. The work of finding a cause may sometimes be begun in either one of the two fields, and then continued in the other. In the exhibition, in Chapter IV., of the process of finding by induction the

origin of a case of poisoning, we were supposed to have found a few alternatives among which the cause must lie. And it was remarked that, unless by means of experiment or of the evidence of other facts we could make choice among these alternatives, we must be content to stop short of complete discovery. Now the evidence of other facts may be evidence collected and utilised in the field of history. If induction leads no farther than to the conclusion that poison has been introduced into some one of several articles of food, there may be facts, of which illation can make use, pointing to the conclusion that poison was introduced by a certain person, or on a certain occasion, into a particular one of the given articles. And so too, on the other hand, if by illation we should be led to the conclusion that poison has been introduced into some one of a number of dishes, and these dishes should be variously partaken of by different persons, induction might enable us to discover the one particular dish which contained the poison.

V. Before concluding this discussion of illative inference, the attention of the reader must be directed to the fact, that in assent given to propositions on the evidence of testimony we have a notable exemplification of it. This point is not brought forward for the mere purpose of illustrating further the method of illation, but, rather, in order to emphasise the use that is actually made of it. The mental process of being convinced by testimony is a phenomenon which plainly needs to be accounted for, and we find in the illative method the required explanation. A person testifies, let us say, to the existence of some object or circumstance which he professes to have seen. What rational ground have we then for accepting it as true that this object or circumstance has existence? Why should we place reliance (1) upon the accuracy of his

perception, and (2) upon a harmony between his perception and his speech? By what course of reasoning can we reach the conclusion, that the actual existence of the alleged object or circumstance is the true explanatory cause of his saying what he does? The problem appears to be one the solution of which is to be found in the field of history, and not in the field of natural law.

It may, indeed, be taken to be a law of nature, that there is in every man a faculty of seeing things in some measure as they are. And it may, further, be taken to be a law of nature, that there is in every man some disposition to testify in accordance with what he supposes that he has seen. But no less must it be held to be a law of nature, that there is in the case of every man some liability to misinterpret what lies before him, and some disposition to subordinate testimony to the satisfaction of his own desires. And, in the absence of knowledge of the relative strength of faculties and motives, we can only say, with respect to men in general, that, according to the laws of nature, a person may or may not be trustworthy as an observer, and may or may not be trustworthy as a reporter.

If, as no doubt we may, we choose to consider that a good and prolonged education is a cause moving men strongly, both in the direction of seeing correctly, and in the direction of speaking truly, then perhaps we are entitled to hold, that in the case of well-educated persons of full age there is a strong tendency to report correctly the things of which they speak. We may say, in the field of natural law, Most well-educated persons of full age speak the truth. In other words, A well-educated person of full age speaks the truth, unless, as occasionally happens, some special circumstances prevent his doing so.

Can we now go on to formulate a law of nature setting forth the circumstances in which causes arise that are

strong enough to counteract the habit of speaking truly? Is it possible to say that a well-educated person of mature age is, in the absence of certain conditions, to be believed, and, in the presence of these conditions, not to be believed? Surely it is utterly impossible to formulate a law of nature by which our attitude towards a witness, even one well-educated and of mature age, is rigidly to be guided. It would, apparently, be a perfectly hopeless task to attempt to classify, even in the limited case of well-educated and adult persons, those who on any given occasion would speak the truth, and those whose word, whether on account of misapprehension or of dishonesty, is not to be credited. The question, whether a given individual, who asserts that he was the witness of some phenomenon, is or is not to have credit given to his statements, is a question which cannot possibly be solved by means of any received general truths of the field of natural law. It is a question which belongs essentially to the field of history.

The problem to be solved is this: A witness testifying to some particular circumstance, what is the cause of his so testifying? from the fact of his testimony being such as it is, what further fact are we led to infer? And the method of solving it is the method of illation.

First, his testimony, whatever it may be, is a fact which, in accordance with what we already know of like concrete effects, may be ascribed, either (1) to accurate observation and truthful speech, or (2) to inaccurate observation and truthful speech, or (3) to deliberate perversion of facts observed, or (4) to exercise of imagination or invention. Secondly, we may call to our aid, as effects presumably springing from the same cause as the statements which he makes, particulars of the manner in which he gives his evidence. If he appears to speak openly and straightforwardly, we consider, either that he has no intention to

deceive, or that he is a master of the art of concealing his real character. If, again, he shows no undue anxiety for his statements to be accepted, we judge, either that he is speaking impartially, or that he is exercising some amount of self-restraint. And if he impresses us as a person of gravity and decorum, we consider that he is speaking, not of any creations of his own, but of things belonging to the domain of real life. Putting together his words and these other co-existing facts, we have ground for concluding that his statements are to be ascribed to his reporting truthfully what he thinks that he has seen. Lastly, if we know him to be a person who has some trained power of observing accurately things similar to the one concerning which he now gives evidence, and who has a strong disposition to report truthfully what he sees, we have in this power and disposition a particular known cause, which it is reasonable to associate with the effects before us. It is reasonable to conclude, that there is a particular act of accurate observing, followed by truthful speaking, which is an intermediate phenomenon between the known character of the witness on the one hand, and the statements heard, and particulars of manner noted, on the other hand. In other words, the evidence which we hear has, as we infer, its source in the witness seeing an event and reporting it as it happened.

Inference from concurrent testimony is likewise made by the method of illation, though the process of reasoning, after the first step, is somewhat different: it does not need to be carried quite so far. We have before us a number of witnesses, concerning whose individual veracity we make no inference. Each of them, regarded separately, may or may not be speaking truly. His statement may proceed from accurate observation and truthful speech, or it may proceed from a variety of other sources. The combined statements are so many phenomena which we associate

together as effects presumably having a common origin. The required kind of common origin we find—with an assurance proportioned to the number of independent witnesses, and to the supposed paucity of the causes that would lead them to speak untruly—to be, truthfully reporting something which has been accurately observed. And a necessary cause or condition of all being on this occasion accurate observers and truthful reporters is, as we at once perceive, the occurrence of the event to which they unite in testifying. We conclude, accordingly, that the event in question has actually happened.

Illation, then, and illation only—it is here maintained—can account for our accepting facts as true on the ground of their being represented to us as true by other persons; whether the testimony be that of a single witness of whose veracity we become assured, or the concurrent testimony of a number of persons whose individual credibility is more or less undetermined.

CHAPTER XII.

NEWMAN'S "GRAMMAR OF ASSENT."

I. IN Newman's well-known *Grammar of Assent* we have a serious and methodical attempt to exhibit the mind's action in giving assent to undemonstrable propositions. His purpose, like our own, is to vindicate, in the interest of religious faith, the naturalness and reasonableness of holding a certain class of beliefs, beliefs which are neither the immediate outcome of intuition or of the evidence of sense, nor capable of being logically proved. His book thus having in view the same object as ourselves, and being, as it is, a treatise of acknowledged weight, it will be well that we should consider carefully the nature of his argument. It is desirable, in defence of the position we are taking up, to claim the support of his great authority for points on which we find ourselves in agreement with him; and it is desirable that, where on important points we differ or seem to differ from him, some explanation of the difference should be submitted to the judgment of the reader.

The position which is the groundwork of our four previous chapters—that there is a class of inferred truths to which logical methods are powerless to lead—forms likewise the basis of Newman's argument. Let us for the moment confine our attention to the two classes of inferred proposition which the mind receives as true, reserving for later consideration the two classes of evidence on which it acts. It

will be readily understood that in the distinction which has been drawn between inference in the field of natural law and inference in the field of history there is implied a distinction between assent in the one field and assent in the other. Inference, inductive and illative, has been taken to signify a completed act of passing from the known to the unknown, and so to include the final stage, which is unconditional assent to the newly discovered truth. We may say, then, that one part of our fundamental position is, that assent means one thing in the field of natural law and another thing in the field of history; that in the former field it is given to propositions about things abstract and individual, and in the latter to propositions concerning things concrete and related to other things.

This distinction, so far as it relates to a difference between assent to propositions about things abstract and assent to propositions concerning things concrete, is dwelt upon at some length by Newman. He speaks of the former as notional and of the latter as real assent. To real assent he also assigns the term belief. On the one hand—so he lays it down—we apprehend abstractions, and assent to propositions about abstract notions; on the other hand, we apprehend real existences, and give our assent to propositions about concrete things. His presentation of his argument is not succinct enough to lend itself readily to quotation, but the following passages will, perhaps, sufficiently confirm and illustrate what has been said.

“There are propositions, in which one or both of the terms are common nouns, as standing for what is abstract, general, and non-existing, such as ‘Man is an animal, some men are learned, an Apostle is a creation of Christianity, a line is length without breadth, to err is human, to forgive divine.’ These I shall call notional propositions, and the

apprehension with which we infer or assent to them, notional.

"And there are other propositions, which are composed of singular nouns, and of which the terms stand for things external to us, unit and individual, as 'Philip was the father of Alexander,' 'the earth goes round the sun,' 'the Apostles first preached to the Jews;' and these I shall call real propositions, and their apprehension real.

"There are then two kinds of apprehension or interpretation to which propositions may be subjected, notional and real.

"Next I observe, that the same proposition may admit of both of these interpretations at once, having a notional sense as used by one man, and a real as used by another. Thus a schoolboy may perfectly apprehend, and construe with spirit, the poet's words, 'Dum Capitolium scandet cum tacitâ Virgine Pontifex;' he has seen steep hills, flights of steps, and processions; he knows what enforced silence is; also he knows all about the Pontifex Maximus, and the Vestal Virgins; he has an abstract hold upon every word of the description, yet without the words therefore bringing before him at all the living image which they would light up in the mind of a contemporary of the poet, who had seen the fact described, or of a modern historian who had duly informed himself in the religious phenomena, and by meditation had realised the Roman ceremonial, of the age of Augustus. Again, 'Dulce et decorum est pro patriâ mori,' is a mere common-place, a terse expression of abstractions in the mind of the poet himself, if Philippi is to be the index of his patriotism, whereas it would be the record of experiences, a sovereign dogma, a grand aspiration, inflaming the imagination, piercing the heart, of a Wallace or a Tell."¹

¹ *An Essay in Aid of a Grammar of Assent*, by John Henry Cardinal Newman, ch. i. § 2.

"There is a third remark suggested by the view which I have been taking of real assents, viz., that they are of a personal character, each individual having his own, and being known by them. It is otherwise with notions; notional apprehension is in itself an ordinary act of our common nature. All of us have the power of abstraction, and can be taught either to make or to enter into the same abstractions; and thus to co-operate in the establishment of a common measure between mind and mind. And, though for one and all of us to assent to the notions which we thus apprehend in common, is a further step, as requiring the adoption of a common stand-point of principle and judgment, yet this too depends in good measure on certain logical processes of thought, with which we are all familiar, and on facts which we all take for granted."¹

Let us now take notice of a point, most important in its bearing upon the question of the generation of real assent, in which Newman's view is not in accord with ours. Though he agrees with us in distinguishing between things abstract and things concrete, yet he differs from us in not distinguishing between things individual and things related to other things. Except for purposes of comparison and abstraction he looks upon things, whether notionally or really apprehended, as only individual. He writes as follows:—"All things in the exterior world are unit and individual, and are nothing else; but the mind not only contemplates those unit realities, as they exist, but has the gift, by an act of creation, of bringing before it abstractions and generalisations, which have no existence, no counterpart, out of it."² "We are ever grouping and discriminating, measuring and sounding, framing cross classes and cross divisions, and thereby rising from particulars to generals, that is, from images to notions. In processes of this kind we regard things, not as they are

¹ Ch. iv. § 2.

² Ch. i. § 2.

in themselves, but mainly as they stand in relation to each other. We look at nothing simply for its own sake; we cannot look at any one thing without keeping our eyes on a multitude of other things besides. 'Man' is no longer what he really is, an individual presented to us by our senses, but as we read him in the light of those comparisons and contrasts which we have made him suggest to us. He is attenuated into an aspect, or relegated to his place in a classification. Thus his appellation is made to suggest, not the real being which he is in this or that specimen of himself, but a definition."¹

It thus comes to pass that Newman's line of demarcation between notions and things, between abstractions and real existences, does not quite coincide with ours. With us a clothed abstraction, such as a particular specimen of manhood, is still an abstraction so long as it is regarded as individual and unrelated to its environment. It is still a phenomenon belonging to the field of natural law and lying within the domain of logic. It ceases to be an abstraction, and passes, as a concrete thing, into the field of history, only when the relations in which it stands to things around it constitute part of our conception of it. Newman, however, makes the criterion of abstractions and of concrete things consist, not in their standing alone or being related to other things, but in the degree of vividness with which they happen to be realised. An object is not apprehended, in the two cases, in different ways, but only with different degrees of strength. The following passages may be quoted in confirmation of these remarks.

"I have already given various illustrations of Real Assent; I will follow them up here by some instances of the change of Notional Assent into Real. . . . Twenty years ago, the Duke of Wellington wrote his celebrated letter on

¹ Ch. iii.

the subject of the national defences. His authority gave it an immediate circulation among all classes of the community; none questioned what he said, nor as if taking his words on faith merely, but as intellectually recognising their truth; yet few could be said to see or feel that truth. His letter lay, so to say, upon the pure intellect of the national mind, and nothing for a time came of it. But eleven years afterwards, after his death, the anger of the French colonels with us, after the attempt upon Louis Napoleon's life, transferred its facts to the charge of the imagination. Then forthwith the national assent became in various ways an operative principle, especially in its promotion of the volunteer movement. The Duke, having a special eye for military matters, had realised the state of things from the first; but it took a course of years to impress upon the public mind an assent to his warning deeper and more energetic than the reception it is accustomed to give to a clever article in a newspaper or a review."¹

"It is plain what a different sense language will bear in this system of intellectual notions from what it has when it is the representative of things: and such a use of it is not only the very foundation of all science, but may be, and is, carried out in literature and in the ordinary intercourse of man with man. And thus it comes to pass that individual propositions about the concrete almost cease to be, and are diluted or starved into abstract notions. The events of history and the characters who figure in it lose their individuality. States and governments, society and its component parts, cities, nations, even the physical face of the country, things past, and things contemporary, all that fulness of meaning which I have described as accruing to language from experience, now that experience is absent, necessarily becomes to the multitude of men nothing but a

¹ Ch. iv. § 2.

heap of notions, little more intelligible than the beauties of a prospect to the short-sighted, or the music of a great master to a listener who has no ear."¹

II. Having realised the distinction drawn between the two kinds of assent, or the two classes of proposition to which assent is given, we pass on to the very important question of the sources from which assent springs. This will lead, in the present section, to some discussion of the subject of inference, that is, of logical or formal inference.

Let us notice, first, that no assent is, in Newman's view, involved in this kind of inference. He is at great pains to exhibit the two things as essentially distinct. "Assent," he says, "is unconditional; else, it is not really represented by assertion. Inference is conditional, because a conclusion at least implies the assumption of premisses."² And, commenting on statements made by Locke, he writes as follows:—

"The first question which this theory leads me to consider is, whether there is such an act of the mind as assent at all. If there is, it is plain it ought to show itself unequivocally as such, as distinct from other acts. For if a professed act can only be viewed as the necessary and immediate repetition of another act, if assent is a sort of reproduction and double of an act of inference, if when inference determines that a proposition is somewhat, or not a little, or a good deal, or very like truth, assent as its natural and normal counterpart says that it *is* somewhat, or not a little, or a good deal, or very like truth, then I do not see what we mean by saying, or why we say at all, that there is any such act. It is simply superfluous, in a psychological point of view, and a curiosity for subtle minds, and the sooner it is got out of the way the better. When I assent, I am supposed, it seems, to do precisely what I do when I

¹ Ch. iii.

² Ch. i. § 1.

infer, or rather not quite so much, but something which is included in inferring; for, while the disposition of my mind towards a given proposition is identical in assent and in inference, I merely drop the thought of the premisses when I assent, though not of their influence on the proposition inferred. This, then, and no more after all, is what nature prescribes; and this, and no more than this, is the conscientious use of our faculties, so to assent forsooth as to do nothing else than infer. Then, I say, if this be really the state of the case, if assent in no real way differs from inference, it is one and the same thing with it. It is another name for inference, and to speak of it at all does but mislead. Nor can it be fairly urged as a parallel case that an act of conscious recognition, though distinct from an act of knowledge, is after all only its repetition. On the contrary, such a recognition is a reflex act with its own object, viz., the act of knowledge itself. As well might it be said that the hearing of the notes of my voice is a repetition of the act of singing:—it gives no plausibility then to the anomaly I am combating.

“I lay it down, then, as a principle that either assent is intrinsically different from inference, or the sooner we get rid of the word in philosophy the better. If it be only the echo of an inference, do not treat it as a substantive act; but, on the other hand, supposing it be not such an idle repetition, as I am sure it is not,—supposing the word ‘assent’ does hold a rightful place in language and in thought,—if it does not admit of being confused with concluding and inferring,—if the two words are used for two operations of the intellect which cannot change their character,—if in matter of fact they are not always found together,—if they do not vary with each other,—if one is sometimes found without the other,—if one is strong when the other is weak,—if sometimes they seem even in conflict with each other,—then,

since we know perfectly well what an inference is, it comes upon us to consider what, as distinct from inference, an assent is, and we are, by the very fact of its being distinct, advanced one step towards that account of it which I think is the true one."¹

Here Newman's view appears to be at variance with our own. We may, indeed, without difficulty concede the point, that assent is not merely another name for inference; for assent may no doubt be given to truths which become known to us otherwise than by inference, and also may continue to be given to inferred truths long after the act or process of inferring them has faded from the memory. But nevertheless we must maintain that true inference includes assent, being a completed passage from things known to things hitherto unknown. The state or condition of being in London, it may well be granted, is not the same thing as travelling to London; and yet the having completed the journey involves the being in that city. In a somewhat similar manner, as it seems, the passage of the mind from old facts to new includes the resting in, or giving assent to, those that are new.

But, secondly, let us inquire what it is that Newman understands by inference. If we find that he and we, when making use of the term, do not mean by it the same thing, it is possible that, though there is not accordance, yet there is no very notable discrepancy between the two views of the relation in which assent stands to inference. It is, at all events, desirable that we should be careful to examine the matter from his own standpoint.

In this book logical inference has been represented as consisting of induction and deduction. From such a fact as, John died, taken in conjunction with other similar facts, we reach the inferred conclusion, John's manhood was the cause

¹ Ch. vi. § 1.

of his death. And from this latter fact we may pass on to the inferred conclusion, Any man must die; or, Richard must die. But the conclusion, Richard must die, instead of being drawn directly from the ascertained fact, John's manhood was the cause of his death, may be drawn from it indirectly by means of the general or abstract conclusion, Any man must die; the abstract conclusion being specially interpreted with reference to Richard.

Now it has been maintained in the chapter on deduction, that the latter part of this indirect method of reaching a new particular conclusion, a part which may be presented in the form of syllogism, is not inference. It is argued, with Mill, that inference ceases with the abstract conclusion, and that deriving the particular from the abstract is not inference, but interpretation.

But Newman, as we shall see, considers that this, which we deny to be inference, constitutes the main part of logical or formal inference. And thus he is led to condemn, on two grounds, the uncertainty of inferential conclusions. Conclusions reached by inference—that is, by syllogism—cannot, he argues, command unqualified assent owing to their uncertainty. In the first place, they rest on premises which are assumed, not proved; in the second place, the application of a general rule to a concrete case is liable to error. The following passage is a part of what he says on the subject of the syllogism.

“The first step in the inferential method is to throw the question to be decided into the form of a proposition; then to throw the proof itself into propositions, the force of the proof lying in the comparison of these propositions with each other. When the analysis is carried out fully and put into form, it becomes the Aristotelic syllogism. However, an inference need not be expressed thus technically; an enthymeme fulfils the requirements of what I have called

Inference. So does any other form of words with the mere grammatical expressions, 'for,' 'therefore,' 'supposing,' 'so that,' 'similarly,' and the like. Verbal reasoning, of whatever kind, as opposed to mental, is what I mean by inference, which differs from logic only inasmuch as logic is its scientific form. And it will be more convenient here to use the two words indiscriminately, for I shall say nothing about logic which does not in its substance also apply to inference.

"Logical Inference, then, being such, and its office such as I have described, the question follows, how far it answers the purpose for which it is used. It proposes to provide both a test and a common measure of reasoning; and I think it will be found partly to succeed and partly to fail; succeeding so far as words can in fact be found for representing the countless varieties and subtleties of human thought, failing on account of the fallacy of the original assumption, that whatever can be thought can be adequately expressed in words.

"In the first place, Inference, being conditional, is hampered with other propositions besides that which is especially its own, that is, with the premisses as well as the conclusion, and with the rules connecting the latter with the former. It views its own proper proposition in the medium of prior propositions, and measures it by them. It does not hold a proposition for its own sake, but as dependent upon others, and those others it entertains for the sake of the conclusion. Thus it is practically far more concerned with the comparison of propositions, than with the propositions themselves. It is obliged to regard all the propositions, with which it has to do, not so much for their own sake, as for the sake of each other, as regards the identity or likeness, independence or dissimilarity, which has to be mutually predicated of them. It follows from this, that the more simple and definite are

the words of a proposition, and the narrower their meaning, and the more that meaning in each proposition is restricted to the relation which it has to the words of the other proposition compared with it,—in other words, the nearer the propositions concerned in the inference approach to being mental abstractions, and the less they have to do with the concrete reality, and the more closely they are made to express exact, intelligible, comprehensible, communicable notions, and the less they stand for objective things, that is, the more they are the subjects, not of real, but of notional apprehension,—so much the more suitable do they become for the purposes of Inference.”¹

III. Let us now, of Newman's two grounds of objection to the conclusions of what he looks upon as logical or formal inference, make some examination of the former, leaving the latter for consideration in the following section. The one bears upon the question of notional assent as well as real; the other is concerned with the question of real assent only. Syllogistic conclusions cannot in general—so he seems to say—be absolutely assented to, because the premises on which they are based are for the most part no more than assumptions. The following are his own words, which seem undoubtedly intended to apply to abstract matters as well as concrete.

“Inference comes short of proof in concrete matters, because it has not a full command over the objects to which it relates, but merely assumes its premisses. In order to complete the proof, we are thrown upon some previous syllogism or syllogisms, in which the assumptions may be proved; and then, still farther back, we are thrown upon others again, to prove the new assumptions of that second order of syllogisms. Where is this process to stop? especially since it must run upon separated, divergent, and multiplied lines of

¹ Ch. viii. § 1.

argument, the farther the investigation is carried back? At length a score of propositions present themselves, all to be proved by propositions more evident than themselves, in order to enable them respectively to become premisses to that series of inferences which terminates in the conclusion which we originally drew. But even now the difficulty is not at an end; it would be something to arrive at length at premisses which are undeniable, however long we might be in arriving at them; but in this case the long retrospection lodges us at length at what are called first principles, the recondite sources of all knowledge, as to which logic provides no common measure of minds,—which are accepted by some, rejected by others,—in which, and not in the syllogistic exhibitions, lies the whole problem of attaining to truth,—and which are called self-evident by their respective advocates because they are evident in no other way. One of the two uses contemplated in reasoning by rule, or in verbal argumentation, was, as I have said, to establish a standard of truth and to supersede the *ipse dixit* of authority: how does it fulfil this end, if it only leads us back to first principles, about which there is interminable controversy? We are not able to prove by syllogism that there are any self-evident propositions at all; but supposing there are (as of course I hold there are), still who can determine these by logic? Syllogism, then, though of course it has its use, still does only the minutest and easiest part of the work, in the investigation of truth, for when there is any difficulty, that difficulty commonly lies in determining first principles, not in the arrangements of proofs.”¹

Now surely this objection to the inclusion of assent in inference is not capable of being sustained. Does it not involve a somewhat strange assumption? Does it not imply that unconditional assent to the premises of a syllogism is

¹ Ch. viii. § 1.

only given in the case of incontrovertible objective truth? Does it not say, in effect, that assent to a conclusion, depending upon assent to a previous conclusion, will, in general, partake of the uncertainty in which first principles are confessedly involved? But if assent is a subjective matter, if for each individual there are propositions to which, though they may be denied by others, he personally gives a full assent—and this undoubtedly appears to be the case—how does controversy concerning them affect the possibility of his building upon them innumerable other propositions which he looks upon as true? Surely the mind may reason syllogistically without the concurrence of other persons in the major premise.

But if this view of Newman's should be correct, if syllogistic conclusions are not, in general, absolutely assented to, what then, we have to ask, is the immediate source of the notional assent, that undoubtedly exists, to propositions that are neither first principles nor entirely based upon incontrovertible first principles?

To this obvious and important question we shall not find in Newman's treatise any satisfactory reply. He does not profess, indeed, to be giving much attention to notional assent; it is real assent which he is specially anxious to distinguish from inference. Notional assent, while he contends that it is different from inference, and cites examples of cases in which he says that it is given, he nevertheless practically treats, either as if it scarcely had existence, or as if it were almost synonymous with inference. He writes as follows:—

“We may call it then the normal state of Inference to apprehend propositions as notions; and we may call it the normal state of Assent to apprehend propositions as things. If notional apprehension is most congenial to Inference, real apprehension will be the most natural concomitant on Assent.

An act of Inference includes in its object the dependence of its thesis upon its premisses, that is, upon a relation, which is an abstraction; but an act of Assent rests wholly on the thesis as its object, and the reality of the thesis is almost a condition of its unconditionality."¹ "In comparison of the directness and force of the apprehension, which we have of an object, when our assent is to be called real, Notional Assent and Inference seem to be thrown back into one and the same class of intellectual acts, though the former of the two is always an unconditional acceptance of a proposition, and the latter is an acceptance on the condition of an acceptance of its premisses. In its notional assents as well as in its inferences, the mind contemplates its own creations instead of things; in real, it is directed towards things, represented by the impressions which they have left on the imagination. These images, when assented to, have an influence both on the individual and on society, which mere notions cannot exert."²

IV. Newman's first objection, then, to inference as a source of assent appears to be one having little or no weight, even when we put his own interpretation upon the term inference. Almost identifying it with syllogistic reasoning, he seems to maintain that, since the propositions constituting the premises are for the most part incapable of being absolutely demonstrated, the conclusions drawn from them are for the most part not unconditionally assented to. The second objection, which applies to real assent only, is more worthy of attention. It is, that syllogistic reasoning deals with abstractions, and on this account can never lead to more than probable conclusions in relation to concrete things.

In the view that we have taken of the difference in character between conclusions in the field of natural law and conclusions in the field of history, the difference has

¹ Ch. iv.

² Ch. iv. § 2.

been regarded as subjective no less than objective. That is to say, the mind of the reasoner is supposed to be more or less conscious that its inductive and deductive inferences do not place it in possession of the same kind of truth about things as it manages to attain to in another way. It is supposed to recognise the limitations of these modes of reasoning, and to perceive that, so far as concrete things are dealt with by them, they are dealt with only as clothed abstractions. It is supposed to be more or less aware that it is not, and cannot be, by following logical methods, that it comes to assent to propositions in the field of history. Newman, however, prefers to base his depreciation of logical argument, as a means to assent in concrete matters, solely on objective grounds. He endeavours to show that it cannot be trusted to lead to objective truth about concrete things. Instead of showing that the mind of the reasoner is not, in fact, led by the methods of logic to real assent, he seeks to make good the position that it cannot rely upon the objective truth of the conclusions to which logic points. The quality of probability or uncertainty which, in his view, accompanies logical conclusions in their application to concrete things is not regarded as attaching to the mental attitude of the individual thinker, and making this attitude something different from real assent; but it is regarded as belonging objectively to the external world, and imparting such a character to logical conclusions about concrete things that no wise man will unconditionally accept them.

Taking him thus on his own ground, let us see what he has to say in defence of the position that abstract argument cannot lead to concrete truth, a position with which we are, of course, substantially in full accord. Let us see how far, treating the matter in relation to objective truth, he is successful in upholding this thesis. It will be well to give a somewhat long quotation.

"Science, working by itself, reaches truth in the abstract, and probability in the concrete; but what we aim at is truth in the concrete. This is true of other inferences besides mathematical. They come to no definite conclusions about matters of fact, except as they are made effectual for their purpose by the living intelligence which uses them. 'All men have their price; Fabricius is a man; he has his price;' but he had not his price; how is this? Because he is more than a universal; because he falls under other universals; because universals are ever at war with each other; because what is called a universal is only a general; because what is only general does not lead to a necessary conclusion. Let us judge him by another universal. 'Men have a conscience; Fabricius is a man; he has a conscience.' Until we have actual experience of Fabricius, we can only say, that, since he is a man, perhaps he will take a bribe, and perhaps he will not. 'Latet dolus in generalibus;' they are arbitrary and fallacious, if we take them for more than broad views and aspects of things, serving as our notes and indications for judging of the particular, but not absolutely touching and determining facts.

"Let units come first, and (so-called) universals second; let universals minister to units, not units be sacrificed to universals. John, Richard, and Robert are individual things, independent, incommunicable. We may find some kind of common measure between them, and we may give it the name of man, man as such, the typical man, the *auto-anthropos*. We are justified in so doing, and in investing it with general attributes, and bestowing on it what we consider a definition. But we think we may go on to impose our definition on the whole race, and to every member of it, to the thousand Johns, Richards, and Roberts who are found in it. No; each of them is what he is, in spite of it. Not any one of them is man, as such, or coincides with the *auto-*

anthropos. Another John is not necessarily rational, because 'all men are rational,' for he may be an idiot;—nor because 'man is a being of progress,' does the second Richard progress, for he may be a dunce; nor, because 'man is made for society,' must we therefore go on to deny that the second Robert is a gipsy or a bandit, as he is found to be. There is no such thing as stereotyped humanity; it must ever be a vague, bodiless idea, because the concrete units from which it is formed are independent realities. General laws are not inviolable truths; much less are they necessary causes. Since, as a rule, men are rational, progressive, and social, there is a high probability of this rule being true in the case of a particular person; but we must know him to be sure of it.

"Each thing has its own nature and its own history. When the nature and the history of many things are similar, we say that they have the same nature; but there is no such thing as one and the same nature; they are each of them itself, not identical, but like. A law is not a fact, but a notion. 'All men die; therefore Elias has died;' but he has not died, and did not die. He was an exception to the general law of humanity; so far, he did not come under that law, but under the law (so to say) of Elias. It was the peculiarity of his individuality, that he left the world without dying: what right have we to subject the person of Elias to the scientific notion of an abstract humanity, which we have formed without asking his leave? Why must the tyrant majority create a rule for his individual history? 'But all men are mortal;' not so; what is really meant by this universal is, that 'man as such is mortal,' that is, the abstract, typical *auto-anthropos*; to this major premiss the minor, if Elias is to be proved mortal, ought to be, 'Elias was the abstract man;' but he was not, and could not be such, nor could any one else, any more than the average man of an

Insurance Company is every individual man who insures his life with it. Such a syllogism proves nothing about the veritable Elias, except in the way of antecedent probability. If it be said that Elias was exempted from death, not by nature, but by miracle, what is this to the purpose, undeniable as it is? Still, to have this miraculous exemption was the personal prerogative of Elias. We call it miracle, because God ordinarily acts otherwise. He who causes men in general to die, gave to Elias not to die. This miraculous gift comes into the individuality of Elias. On this individuality we must fix our thoughts, and not begin our notion of him by ignoring it. He was a man, and something more than 'man;' and if we do not take this into account, we fall into an initial error in our thoughts of him. . . .

"Nor does any real thing admit, by any calculus of logic, of being dissected into all the possible general notions which it admits, nor, in consequence, of being recomposed out of them; though the attempt thus to treat it is more unpromising in proportion to the intricacy and completeness of its make. We cannot see through any one of the myriad beings which make up the universe, or give the full catalogue of its belongings. We are accustomed, indeed, and rightly, to speak of the Creator Himself as incomprehensible; and, indeed, He is so by an incommunicable attribute; but in a certain sense each of His creatures is incomprehensible to us also, in the sense that no one has a perfect understanding of them but He. We recognise and appropriate aspects of them, and logic is useful to us in registering these aspects and what they imply; but it does not give us to know even one individual being.

"So much on logical argumentation; and in thus speaking of the syllogism, I speak of all inferential processes whatever, as expressed in language (if they are such as to

be reducible to science), for they all require general notions, as conditions of their coming to a conclusion."¹

In the above passage there appear to be contained two chief grounds for affirming that a general law cannot invariably be applied with truth to a particular case, two main reasons therefore for refusing to give unconditional assent to the conclusions of a syllogism. These grounds or reasons are as follows.

1. Some other general law may, in practice, come into contact with the one under consideration, modifying or neutralising the result expected. Fabricius as a man, not only is amenable to bribery, but also offers resistance to it. And thus it may well happen that on some given occasion he will not show himself corrupt.

An answer to this objection to the conclusiveness of syllogistic reasoning may be made in this way. Either, it may be said, the proposition constituting the major premise is not the statement of an abstract or a universal truth, and is therefore quite improperly made use of; or the proposition containing the conclusion is misinterpreted. The major premise of the syllogism must properly represent one of two things, the actually observed universal fact, All men whatsoever, Fabricius included, have been found to have their price; or an abstract law of nature, Any man whatsoever has his price. Now if, professing to use a universal, or a law of nature, we employ a proposition which expresses the result only of a partial observation of existing things; if in the enumeration Fabricius himself has not been included, or if there is no ascertained relation of causation between manhood and venality, then we have no ground, so far as syllogism is concerned, for coming to any definite conclusion whatever about him. If, however, the major premise is a true law of nature, Any man has his price, then the conclu-

¹ Ch. viii. § 1.

sion, Fabricius has his price, is properly assented to. But in the two propositions "having a price" must be interpreted similarly. If we demur rightly to the conclusion that Fabricius is certainly corruptible, then instead of accepting, Any man is certainly corruptible, as a major premise, we must allow no more than that, Any man is liable to yield to bribery.

2. The minor premise, bringing the particular case under the general law, may be improperly assumed. For every individual person differs in some respect from his fellows, and so may be incapable of being placed with them in any given class. Elias, for instance, in the matter of liability to death, was not a man like other men, and so was not subject to the general law of humanity.

To this the answer seems to be twofold. First, in so far as men are different the one from the other, we do not reason syllogistically about them. It is not that in the sphere of difference we have syllogistic conclusions which are only probable; but we have, in this sphere, no syllogistic reasoning at all. If, in saying, All men die, we mean that liability to death is an attribute belonging to abstract humanity, we are using as a major premise an assertion which we are only justified in making in consequence of having learned that a cause of death is contained in that humanity which all men alike share. If it is possible for death to have its cause in a part of human nature which is not common to all men, then we err if we construct a syllogism having as its major premise, All men die. Secondly, on the supposition of our knowing that there is in abstract humanity a cause of death, then syllogistic reasoning leads to the certain conclusion, that Elias, if he was in the ordinary sense of the term a man, had in him a cause of death. If he was not a man, we predicate nothing of him. But Elias, though a man and having in him a cause of death, did not die. How

is this to be explained? The simple explanation is, that experience teaches that together with the cause of death is sometimes joined a cause which counteracts its working. This teaching of experience as to the grouping of causes belongs to the field of history, and in no way detracts from the certainty of relation between cause and effect in the field of natural law.

It may not be amiss to notice in this connection, that Newman appears to have a very inadequate conception of the order of nature in the domain of natural law. While recognising a certain amount of invariableness in nature, he does not admit the existence of a uniform and necessary relation between cause and effect. Instead of attributing similar effects to precisely similar phenomenal causes, and variations in them to the modifying action of concurrent causes, he prefers to look upon them as owing their existence to Divine Will, concerning which Will absolute uniformity cannot, of course, be predicated. So much has already been said in previous chapters of this book on the subject of causation, that there is no need to enter here upon a discussion of it. It will suffice—after reminding the reader that the view here taken is, that all inference is based upon a conception of the order of nature, and that this conception in no way interferes with the further conception of a Creator and Governor whose Will is itself a cause, though not a phenomenal one—to quote from Newman's words. He writes as follows:—

“Of these two senses of the word ‘cause,’ viz., that which brings a thing to be, and that on which a thing under given circumstances follows, the former is that of which our experience is the earlier and more intimate, being suggested to us by our consciousness of willing and doing. The latter of the two requires a discrimination and exactness of thought for its apprehension, which implies special mental training ;

else, how do we learn to call food the cause of refreshment, but day never the cause of night, though night follows day more surely than refreshment follows food? Starting, then, from experience, I consider a cause to be an effective will; and, by the doctrine of causation, I mean the notion, or first principle, that all things come of effective will; and the reception or presumption of this notion is a notional assent.

"As to causation in the second sense (*viz.*, an ordinary succession of antecedents and consequents, or what is called the Order of Nature), when so explained, it falls under the doctrine of general laws; and of this I proceed to make mention, as another first principle or notion, derived by us from experience, and accepted with what I have called a presumption. By natural law I mean the fact that things happen uniformly according to certain circumstances, and not without them and at random: that is, that they happen in an order; and, as all things in the universe are unit and individual, order implies a certain repetition, whether of things or like things, or of their affections and relations. . . .

"There are philosophers who go farther, and teach, not only a general, but an invariable, and inviolable, and necessary uniformity in the action of the laws of nature, holding that everything is the result of some law or laws, and that exceptions are impossible; but I do not see on what ground of experience or reason they take up this position. Our experience rather is adverse to such a doctrine, for what concrete fact or phenomenon exactly repeats itself? . . . It seems safer then to hold that the order of nature is not necessary, but general in its manifestations. . . .

"A law is not a cause, but a fact; but when we come to the question of cause, then, as I have said, we have no experience of any cause but Will. If, then, I must answer the question, What is to alter the order of nature? I reply, That which willed it;—That which willed it can unwill it;

and the invariableness of law depends on the unchangeableness of that Will."¹

V. Newman, then, as we have seen, differs from us in his view of what logical inference is, and also in his view of the nature of the conclusions of syllogistic reasoning. But he agrees with us in holding that logical inference does not lead to assent in concrete matters. Further, agreeing with us that such assent is a fact of human nature, he largely differs from us, as we have now to see, in his view of the manner in which it is attained. We, on the one hand, have had explicitly before us a process by which, as it would seem, the mind travels onwards from the known to the unknown. He, on the other hand, considers that the process is substantially a hidden one, not capable of being set forth in words. While we have sought to follow, step by step, the mind's dealing with a number of results of past experience, he is content, or almost content, to lay it down that the mind instinctively draws its conclusions from them.

Before giving his own account of this matter, it may be pointed out, that the possibility of formulating a method of illative inference appears to be dependent upon our regarding phenomena as other than individual. We have looked upon concrete things, or things in the field of history, as related to other things around them; and in our search for causes and effects we have associated phenomena together as presumably forming parts of one and the same whole. Newman, however, looking upon concrete things as individual, is without means to find an exact method, outside the domain of logic, of passing from the known to the unknown. He can do no more than bring together, as grounds or arguments, a number of propositions, and maintain that by their instrumentality the mind somehow reaches the state of assenting to a newly discovered concrete truth. The following passages will

¹ Ch. iv. § 1.

suffice to exhibit his view of this action of the mind, action which he terms informal inference. Although in them he is speaking of the state of certitude, or feeling certain, yet apparently we must take it that simple assent is regarded as being arrived at in a similar way.

"It is plain that formal logical sequence is not in fact the method by which we are enabled to become certain of what is concrete; and it is equally plain, from what has been already suggested, what the real and necessary method is. It is the cumulation of probabilities, independent of each other, arising out of the nature and circumstances of the particular case which is under review; probabilities too fine to avail separately, too subtle and circuitous to be convertible into syllogisms, too numerous and various for such conversion, even were they convertible."¹

"This I conceive to be the real method of reasoning in concrete matters; and it has these characteristics:—First, it does not supersede the logical form of inference, but is one and the same with it; only it is no longer an abstraction, but carried out into the realities of life, its premisses being instinct with the substance and the momentum of that mass of probabilities, which, acting upon each other in correction and confirmation, carry it home definitely to the individual case, which is its original scope.

"Next, from what has been said it is plain, that such a process of reasoning is more or less implicit, and without the direct and full advertence of the mind exercising it. As by the use of our eyesight we recognise two brothers, yet without being able to express what it is by which we distinguish them; as at first sight we perhaps confuse them together, but, on better knowledge, we see no likeness between them at all; as it requires an artist's eye to determine what lines and shades make a countenance look young or old, amiable,

¹ Ch. viii. § 2.

thoughtful, angry or conceited, the principle of discrimination being in each case real, but implicit ;—so is the mind unequal to a complete analysis of the motives which carry it on to a particular conclusion, and is swayed and determined by a body of proof, which it recognises only as a body, and not in its constituent parts.

“And thirdly, it is plain, that, in this investigation of the method of concrete inference, we have not advanced one step towards depriving inference of its conditional character ; for it is still as dependent on premisses as it is in its elementary idea. On the contrary, we have rather added to the obscurity of the problem ; for a syllogism is at least a demonstration, when the premisses are granted, but a cumulation of probabilities, over and above their implicit character, will vary both in their number and their separate estimated value, according to the particular intellect which is employed upon it. It follows that what to one intellect is a proof is not so to another, and that the certainty of a proposition does properly consist in the certitude of the mind which contemplates it. And this of course may be said without prejudice to the objective truth or falsehood of propositions, since it does not follow that these propositions on the one hand are not true, and based on right reason, and those on the other not false, and based on false reason, because not all men discriminate them in the same way.”¹

“On the whole, I think it is the fact that many of our most obstinate and most reasonable certitudes depend on proofs which are informal and personal, which baffle our powers of analysis, and cannot be brought under logical rule, because they cannot be submitted to logical statistics.”¹

“The question arises, whether, granting that the personality (so to speak) of the parties reasoning is an important element in proving propositions in concrete matter, any

¹ Ch. viii. § 2.

account can be given of the ratiocinative method in such proofs, over and above that analysis into syllogism which is possible in each of its steps in detail. I think there can; though I fear, lest to some minds it may appear far-fetched or fanciful; however, I will hazard this imputation. I consider, then, that the principle of concrete reasoning is parallel to the method of proof which is the foundation of modern mathematical science, as contained in the celebrated lemma with which Newton opens his 'Principia.' We know that a regular polygon, inscribed in a circle, its sides being continually diminished, tends to become that circle, as its limit; but it vanishes before it has coincided with the circle, so that its tendency to be the circle, though ever nearer fulfilment, never in fact gets beyond a tendency. In like manner, the conclusion in a real or concrete question is foreseen and predicted rather than actually attained; foreseen in the number and direction of accumulated premisses, which all converge to it, and as the result of their combination, approach it more nearly than any assignable difference, yet do not touch it logically (though only not touching it), on account of the nature of its subject-matter, and the delicate and implicit character of at least part of the reasonings on which it depends. It is by the strength, variety, or multiplicity of premisses, which are only probable, not by invincible syllogisms,—by objections overcome, by adverse theories neutralised, by difficulties gradually clearing up, by exceptions proving the rule, by unlooked-for correlations found with received truths, by suspense and delay in the process issuing in triumphant reactions,—by all these ways, and many others, it is that the practised and experienced mind is able to make a sure divination that a conclusion is inevitable, of which his lines of reasoning do not actually put him in possession. This is what is meant by a proposition being 'as good as proved,' a conclusion as undeniable 'as if it were proved,' and by the

reasons for it 'amounting to a proof,' for a proof is the limit of converging probabilities."¹

There is here need, before we pass on to consider, in another section, the question of a faculty by which we draw conclusions about things concrete, of an explanatory remark. We may well agree with Newman—in respect, at all events, of a very large number of cases—that the mind is unequal to a complete analysis of the motives which carry it on to a particular conclusion. We may be quite content to admit that much of the work of illative inference is performed unconsciously. But at the same time we may hold that the mind, whether consciously or unconsciously, reaches conclusions by the method which has been set forth in the preceding chapter. We may decline to admit that it is sufficient explanation, even of the mind's unconscious action, to say that it somehow sees the result of converging probabilities.

VI. To the mind drawing conclusions, whether by conscious or by unconscious process, in the field of history, we may, if we will, apply a special name. And a term employed by Newman, viz., the illative sense, would seem to be a fitting expression by which to designate it. It would correspond to the term, the sense of order, or moral sense, used in ethics to signify the mind occupied in forming judgments on points of conduct. The sense of order, or moral sense, being a name given to reason, or the mind acting by conscious process, and perception, or the mind acting by unconscious process, in the domain of moral judgments, the expression, the illative sense, may be similarly employed to designate reason and perception as they are seen in the field of illative inferences. In either region—let it be observed—perception seems to play a very considerable part in the drawing of conclusions. For even if the mind should have consciously before it all the different considerations

¹ Ch. viii. § 2.

upon which it acts, and also the method by which it deals with them, yet the task of estimating the absolute force and relative value of these considerations is one that must be performed to a great extent by unconscious process. To a great extent it is perception only that can determine that among alternative courses of conduct, or among alternative solutions of an intellectual problem, this or that course is the one to be followed, this or that proposition the one to be assented to. And since perception may fitly enough be spoken of, by way of figure, as a mental sense, there is propriety in describing it, when employed upon questions of conduct, as the moral sense, and, when employed upon illative inferences, as the illative sense. Nor, since reason and perception are in either case commonly acting in close conjunction with each other, does it seem to be at all a violent straining of language to include reason, with perception, in one and the same appellation.

But Newman, while apparently understanding by the illative sense only what has just been spoken of as perception, further limits the term to the mind drawing illative conclusions of a special kind. The illative sense is not, with him, the mind simply making illative inferences; but it is the mind making illative inferences that are objectively correct. His position herein is not—be it understood—that there is an outward criterion by which objective correctness can be tested, and that the mind may, by reference to it, be sometimes credited with having judged correctly. But it is, apparently, that of every mind a certain part, large or small as the case may be, has the power of determining correctly objective truth, and merits therefore a distinctive name. The following passages contain the substance of his view.

"Certitude is a mental state: certainty is a quality of propositions. Those propositions I call certain, which are

such that I am certain of them. Certitude is not a passive impression made upon the mind from without, by argumentative compulsion, but in all concrete questions (nay, even in abstract, for though the reasoning is abstract, the mind which judges of it is concrete) it is an active recognition of propositions as true, such as it is the duty of each individual himself to exercise at the bidding of reason, and, when reason forbids, to withhold. And reason never bids us be certain except on an absolute proof; and such a proof can never be furnished to us by the logic of words, for as certitude is of the mind, so is the act of inference which leads to it. Every one who reasons is his own centre; and no expedient for attaining a common measure of minds can reverse this truth; but then the question follows, is there any *criterion* of the accuracy of an inference, such as may be our warrant that certitude is rightly elicited in favour of the proposition inferred, since our warrant cannot, as I have said, be scientific? I have already said that the sole and final judgment on the validity of an inference in concrete matter is committed to the personal action of the ratiocinative faculty, the perfection or virtue of which I have called the Illative Sense, a use of the word 'sense' parallel to our use of it in 'good sense,' 'common sense,' a 'sense of beauty,' &c.;—and I own I do not see any way to go farther than this in answer to the question."¹

"This is what I have to remark concerning the Illative Sense, and in explanation of its nature and claims; and on the whole, I have spoken of it in four respects,—as viewed in itself, in its subject-matter, in the process it uses, and in its function and scope.

"First, viewed in its exercise, it is one and the same in all concrete matters, though employed in them in different measures. We do not reason in one way in chemistry or

¹ Ch. ix.

law, in another in morals or religion ; but in reasoning on any subject whatever, which is concrete, we proceed, as far indeed as we can, by the logic of language, but we are obliged to supplement it by the more subtle and elastic logic of thought ; for forms by themselves prove nothing.

" Secondly, it is in fact attached to definite subject-matters, so that a given individual may possess it in one department of thought, for instance, history, and not in another, for instance, philosophy.

" Thirdly, in coming to its conclusion, it proceeds always in the same way, by a method of reasoning, which, as I have observed above, is the elementary principle of that mathematical calculus of modern times, which has so wonderfully extended the limits of abstract science.

" Fourthly, in no class of concrete reasonings, whether in experimental science, historical research, or theology, is there any ultimate test of truth and error in our inferences besides the trustworthiness of the Illative Sense that gives them its sanction ; just as there is no sufficient test of political excellence, heroic action, or gentleman-like conduct, other than the particular mental sense, be it genius, taste, sense of propriety, or the moral sense, to which those subject-matters are severally committed. Our duty in each of these is to strengthen and perfect the special faculty which is its living rule, and in every case as it comes to do our best. And such also is our duty and our necessity, as regards the Illative Sense."¹

Exception must be taken to this view of Newman's of the nature of the illative sense. It seems to be analogous to the mistaken view, upheld by Butler, that there is in every man a certain faculty, known as conscience, whose peculiar function it is to discern and point to objective right. The one philosopher in relation to intellectual judgments in concrete

¹ Ch. ix. § 2.

matters, no less than the other in relation to moral judgments in matters of personal conduct, seems to declare that the faculty which judges correctly is something distinct from the faculty which judges more or less incorrectly. And, further than this, both seem to say that correctness is relative, not at all to the individual nature of the person judging, but only to some objective standard existing more or less outside himself. It is, apparently, as if one should maintain that the palate which approves of wholesome food is a different organ from the palate which approves of food that is unwholesome; and that the wholesomeness of food depends, not at all upon peculiarities of constitution of the individual taster, but only upon the fully developed nature of the perfect man.

VII. We must dissent, then, as we have seen, from Newman's view that the illative process is altogether silent or implicit. We must likewise dissent from the view, which he appears to hold, that there is in man an illative sense which differs from ordinary reason and perception, and takes cognisance only of objective truth. We may, however, agree in a measure with his estimate of the character of the work which the illative sense performs. We may admit that it is possible to describe illation as the extracting a definite conclusion from a cumulation of probabilities.

But this position requires very careful examination. Certainly—it may at once be said—his view of proof as a quasi-mathematical limit of converging probabilities cannot be accepted. In order that it may appear how far we are in agreement or disagreement with him, it seems now to be necessary to institute an investigation of the philosophical and the mathematical meaning of probability. On other grounds, too, such an investigation is at this point desirable. For, in the first place, it may help to win acceptance for the doctrine of illation presented in the preceding chapter,

to exhibit it in its relation to the familiar kinds of argument commonly called probable. And, in the second place, in thus exhibiting the doctrine, it is likely to be made in itself at once more impressive and more clear. To the consideration, then, of probable argumentation we may next address ourselves.

CHAPTER XIII.

PROBABLE CONCLUSIONS.

I. BISHOP BUTLER being often referred to as speaking with authority on the value of evidence that is only probable, this chapter may not inaptly be prefaced by a leading quotation from his writings. At the same time the passage chosen will serve as a convenient basis for the discussion that lies before us. In the introduction to his *Analogy of Religion* he writes as follows:—

“Probable evidence is essentially distinguished from demonstrative by this, that it admits of degrees; and of all variety of them, from the highest moral certainty, to the very lowest presumption. We cannot indeed say a thing is probably true upon one very slight presumption for it; because, as there may be probabilities on both sides of a question, there may be some against it: and though there be not, yet a slight presumption does not beget that degree of conviction, which is implied in saying a thing is probably true. But that the slightest possible presumption is of the nature of a probability, appears from hence, that such low presumption often repeated, will amount even to moral certainty. Thus a man’s having observed the ebb and flow of the tide to-day, affords some sort of presumption, though the lowest imaginable, that it may happen again to-morrow. But the observation of this event for so many days, and months, and ages together, as it has been

observed by mankind, gives us a full assurance that it will.

“That which chiefly constitutes *probability* is expressed in the word *likely*, that is, like some truth or true event; like it, in itself, in its evidence, in some more or fewer of its circumstances. For when we determine a thing to be probably true, suppose that an event has or will come to pass, it is from the mind remarking in it a likeness to some other event, which we have observed has come to pass. And this observation forms, in numberless daily instances, a presumption, opinion, or full conviction, that such an event has or will come to pass; according as the observation is, that the like event has sometimes, most commonly, or always, so far as our observation reaches, come to pass at like distances of time, or place, or upon like occasions. Hence arises the belief, that a child, if it lives twenty years, will grow up to the stature and strength of a man; that food will contribute to the preservation of its life, and the want of it for such a number of days be its certain destruction. So, likewise, the rule and measure of our hopes and fears concerning the success of our pursuits; our expectations that others will act so and so in such circumstances; and our judgment that such actions proceed from such principles;—all these rely upon our having observed the like to what we hope, fear, expect, judge; I say, upon our having observed the like, either with respect to others or ourselves. And thus, whereas the prince, who had always lived in a warm climate, naturally concluded in the way of analogy, that there was no such thing as water becoming hard, because he had always observed it to be fluid and yielding: we, on the contrary, from analogy, conclude, that there is no presumption at all against this; that it is supposable there may be frost in England any given day in January next;

probable, that there will on some day of the month; and that there is a moral certainty, that is, ground for an expectation, without any doubt of it, in some part or other of the winter.

“Probable evidence, in its very nature, affords but an imperfect kind of information, and is to be considered as relative only to beings of limited capacities. For nothing which is the possible object of knowledge, whether past, present, or future, can be probable to an Infinite Intelligence; since it cannot but be discerned absolutely, as it is in itself, certainly true, or certainly false. But, to us, probability is the very guide of life.

“From these things it follows, that in questions of difficulty, or such as are thought so, where more satisfactory evidence cannot be had, or is not seen, if the result of examination be, that there appears, upon the whole, any the lowest presumption on one side, and none on the other, or a greater presumption on one side, though in the lowest degree greater, this determines the question, even in matters of speculation; and, in matters of practice, will lay us under an absolute and formal obligation, in point of prudence and of interest, to act upon that presumption, or low probability, though it be so low as to leave the mind in very great doubt which is the truth. For surely a man is as really bound in prudence to do what upon the whole appears, according to the best of his judgment, to be for his happiness, as what he certainly knows to be so. Nay, further, in questions of great consequence, a reasonable man will think it concerns him to remark lower presumptions and probabilities than these; such as amount to no more than showing one side of a question to be as supposable and credible as the other; nay, such as but amount to much less even than this. For numberless instances might be mentioned respecting the common pur-

suits of life, where a man would be thought, in a literal sense, distracted, who would not act, and with great application too, not only upon an even chance, but upon much less, and where the probability or chance was greatly against his succeeding.

"It is not my design to inquire further into the nature, the foundation, and measure of probability; or whence it proceeds, that *likeness* should beget that presumption, opinion, and full conviction, which the human mind is formed to receive from it, and which it does necessarily produce in every one; or to guard against the errors to which reasoning from analogy is liable. This belongs to the subject of logic, and is a part of that subject which has not yet been thoroughly considered. Indeed, I shall not take upon me to say, how far the extent, compass, and force of analogical reasoning, can be reduced to general heads or rules, and the whole be formed into a system. But though so little in this way has been attempted by those who have treated of our intellectual powers, and the exercise of them, this does not hinder but that we may be, as we unquestionably are, assured, that analogy is of weight, in various degrees, towards determining our judgment, and our practice. Nor does it in any wise cease to be of weight in those cases, because persons, either given to dispute, or who require things to be stated with greater exactness than our faculties appear to admit of in practical matters, may find other cases, in which it is not easy to say, whether it be, or be not, of any weight; or instances of seeming analogies, which are really of none. It is enough to the present purpose to observe, that this general way of arguing is evidently natural, just, and conclusive. For there is no man can make a question but that the sun will rise to-morrow, and be seen, where it is seen at all, in the figure of a circle, and not in that of a square."

It will be well to begin the consideration of the foregoing passage, and so to enter upon the subject of probability, by determining a specific sense in which the terms 'probable' and 'probability' shall be used. It seems highly desirable that both of them should be employed to signify the same kind or degree of uncertainty, and that this kind or degree should remain unchanged. Butler, it will be observed, uses the expressions somewhat loosely. When, for instance, he says that probable evidence admits of all variety of degrees, he evidently means by 'probable' the possessing in some indefinite degree, whether small or great, a claim to be received. But when immediately afterwards he remarks that we cannot affirm a thing to be probably true upon one very slight presumption of it, he appears to understand 'probably' in its popular signification of being seen to have a preponderating claim. Although it cannot, perhaps, be said that his argument suffers in point of clearness from the use which he makes of the terms in question, yet it will be well for us to avoid this possible source of confusion.

Let us, then, agree to understand probable and probability as having reference always to one and the same kind or degree of uncertainty. And let this kind or degree be an indefinite degree, concerning which all that need be known is that it is sufficient to prevent a thing from being unfeignedly assented to on the one hand, or absolutely denied on the other hand. A probable truth or a probable event may thus be one of which we are almost certain, or it may be one of which we are almost able to deny the possibility. It is an alleged fact whose naturalness or possibility must be admitted, but not to the exclusion of the naturalness or possibility of other facts inconsistent with it. It occupies a place as one among a number of alternatives. There is evidence in support of it which cannot, on the one hand,

be altogether set aside, nor, on the other hand, entirely extinguish the evidence adduced in favour of competing facts.

Similarly the term probability, expressing evidence, may be understood to signify evidence which almost amounts to convincing proof, or evidence which affords no more than a slight presumption in favour of the alleged circumstance. The phrase, probable evidence, is thus the equivalent of the term probability. Should we have occasion at any time to speak of this evidence as large or small, strong or weak, we may conveniently make use of some such expressions as, highly probable or slightly probable, high probability or low probability.

It may be further noticed at this point, that probability, besides being capable of being looked upon as high or low, may have a definite numerical value attached to it. The principles by which its value is assessed will be discussed in the chapter following. For the present it will suffice to say that the numerical value of a probability indicates the degree of its approach to certain evidence.

II. Butler, to a great extent correctly, refers probable conclusions, that is, conclusions that a fact or event is probable, to the recognition of likeness between a thing before us and other things that have previously been objects of observation. But he is at no pains to point out, that a conclusion consequent upon a recognition of likeness is not necessarily a probable conclusion. On the contrary, from the instances he gives, he might be taken to imply that all conclusions (other than those of deduction) drawn from a recognition of likeness are in a true sense probable conclusions. He might be supposed to hold that sure or certain evidence is only that which is probable in a very high degree, and full conviction only another name for very strong pre-

sumption. This point we have already had occasion to notice in the chapter on delation, in which some of his illustrations were discussed; and it is not necessary to say more concerning it. Let it be our business now to consider what is the nature of the mental process of concluding that an event is probable. And as we have, in the chapter referred to, examined some sure conclusions, so also let us examine some probable conclusions, set forth in the passage that has been quoted.

"A man's having observed the ebb and flow of the tide to-day, affords some sort of presumption that it may happen again to-morrow." The explanation of this appears to be as follows. We may suppose the phenomenon in question to have been brought about by some unknown combination of causes; and, supposing this, we may, by an act of delative inference, conclude that a similar combination, producing a repetition of the phenomenon, will certainly at some time or other occur again. The combination has manifested itself once as a part of the order of nature, and after some unknown interval of time may be again expected. This conclusion—though, perhaps, in real life we do not practically draw it—seems to be a legitimate result of delative inference, and a result which explains the probable conclusion supposed by Butler to be drawn from a single observation of tidal movements.

For, though we are entitled to affirm that at some time or other the tide will again ebb and flow as we have seen it ebb and flow to-day, yet of the date fixed by nature for the recurrence of the phenomenon we know nothing at all. It may be to-morrow, it may be fifty or a thousand years hence. To-morrow, for anything we know, is on an equality with every other day of some indefinite future space of time; it is one of an indefinite number of alternatives. In connection with each of the

days there is a probability that on it the tidal movements will recur.

III. "We conclude that it is supposable there may be frost in England any given day in January next; probable, that there will on some day of the month; and that there is a moral certainty, that is, ground for an expectation, without any doubt of it, in some part or other of the winter." Here we have three conclusions, the grounds of which we have to seek only in the case of the first two. The third has been quoted for a reason which will appear.

First let it be supposed, that ice has been known to be formed on a given day in January, say the 1st, in some previous winter. We are then able, by means of two acts of delative inference, to reach the conclusion that it will appear on the 1st of January in some future year. For, in the first place, we may be said to recognise more or less definitely and clearly, that there are climatic causes and conditions in respect of which one New Year's day has been in the past precisely similar to another; and these we may expect to continue to operate as usual. And, in the second place, the causes of ice having, as we know, once combined with the causes which permanently characterise the 1st of January, may be expected in the future to combine with them again. Thus, then, we may confidently look for frost on some future New Year's day. Now next New Year's day is one of the series of alternative days on which the expected combination of causes will recur. Hence there is a probability, common to itself and every other member of the series, that the appearance of ice will take place on it.

Secondly, let the supposition be, that ice has been seen on some unrecorded day of January in a former year. From this circumstance we are entitled, as in the case just

noticed, to draw the conclusion, that on some undefined day in January next frost is probable. For an undefined day in January next is one of a number of alternative days, similarly undefined, in successive Januarys, in some one of which months frost may certainly be again expected.

With reference to this second conclusion, that frost will probably—in the sense, that is, of most probably—appear on some day of January next, it must further be pointed out, that we have here a question, not merely of the existence of a probability, but also of its degree or weight in relation to other probabilities. On the one hand, the fact of ice having been seen in some month of January creates a probability that it will again be seen in January next. On the other hand, the fact of some month of January having been observed to pass without the appearance of ice creates a probability that none will appear in the coming January. These opposing probabilities the mind is understood, in the case before us, to weigh the one against the other, concluding that the balance of probability, or the resulting probability, is in favour of the appearance of ice. Consideration of the ground of the mind's action must be reserved for the following chapter.

The reason may now be explained of introducing the conclusion as to the certainty of frost in some part of the winter. Being in possession of this certain knowledge, we may, if we will, derive from it the probability of frost on New Year's day, instead of deriving it in the way pointed out. We have looked upon the 1st of January in the coming year as one of a number of alternative New Year's days, on some one of which we know that there must be frost. But equally well, if we know that there must be frost in some part of the coming winter, we may regard it as one of the hundred days that make up the season.

So again, the 1st of January next is one of the thirty-one alternative days on which frost may appear, if it appears at all in the course of the month. Hence from the probability, that frost may be looked for on some undefined day, there is derivable a lesser probability, that it will appear on the first day of the month in question. This probability, it may be remarked, as the days vanish one by one without the appearance of ice, grows continually stronger in favour of each one that remains.

And yet another way of deriving the probability of frost on New Year's day may be mentioned. We may suppose ourselves to become acquainted with all the different kinds of weather by which previous New Year's days have been characterised. We may have learned that the causes permanently operative on that day have combined sometimes with the causes of frost, and sometimes with the causes of various other kinds of weather. We are thus able to infer that frost is one of the alternative kinds of weather possible on the coming 1st of January.

Let it now be carefully noticed that, in whatever way we derive the probability, the essential principle remains the same. It is, that we have reason to know that the event in question is one of a number of alternatives, the occurrence of any one of which would satisfy expectation.

IV. "We believe that a child, if it lives twenty years, will grow up to the stature and strength of a man; that food will contribute to the preservation of its life, and the want of it for such a number of days be its certain destruction." Here we seem to have two distinct arguments, which require to be noticed separately.

The first case seems to be one, not simply of probability, but also of degree of probability. We have known instances

of children arriving at mature manhood after the expiration of a certain number of years ; but we have likewise known instances of children who have not developed in the usual way. Hence, relying upon the continuity in nature of the grouping of causes and conditions, we recognise a probability that a particular child will attain to the strength and stature of a man, and also a probability that he will not attain to them. It is, apparently, a case of a concrete cause being followed sometimes by one effect, and sometimes by another. Childhood is, according to our experience, followed sometimes by developed manhood, sometimes by stunted faculties and form. In the case, then, of any new child brought under our notice, we have ground for concluding that there is a probability of either issue. At the same time, when we compare the probabilities, we find that the former outweighs the latter.

The second case—the twofold conclusion concerning the relation of food to life—appears to be a sure conclusion in the field of natural law. It appears to be the application to a particular child of an ascertained relation between abstract cause and abstract effect. As such there is no need to comment on it here. It gives occasion, however, for pointing out another source of probable conclusions. We know, in the case before us, that food is certainly a cause of life: induction may be said to have thoroughly established this. But we may very well suppose ourselves to be in the position of having obtained by means of induction some other result not quite so definite. We may suppose ourselves to have ascertained, for example, that the dietary of a certain person is or contains the cause of his conspicuously good health, and yet to have failed to ascertain to which of several articles of food the result is due. We have, say, A B C as residual antecedents, and no means of deciding between their respective claims to

be the cause. This being so, we may say of each that it is a probable cause of the effect in question. Each is one of several alternatives, and the proving of any one of them to be the cause would be a circumstance quite in harmony with our present knowledge.

CHAPTER XIV.

THEORY OF PROBABILITY.

I. THE probable conclusions with which in this book we are specially concerned are such as relate to the sequence of concrete phenomena. Concrete A having once been known to be the cause of concrete B, we are in a position to affirm a probability that any new instance of A will be followed by one of B, and that any new instance of B will have been preceded by one of A.

These and similar probable conclusions are identical with the preliminary conclusions of illative inference. To say that there is a probability of this A being followed by a B, is equivalent to saying that this A may be followed by a B. Now there are two distinct methods by which these conclusions may be dealt with, the method of illation, and the method of probability. There are two distinct ways, that is, in which a number of them taken together may be made to yield one derivative conclusion. And we have to make it our business to inquire into the relation between, and the comparative value of, these two ways or methods. We have to endeavour to ascertain how far we do, or how far we can—as Butler holds, as Newman holds, as Mill holds, that we can and do—reach our assured convictions of truths of history by regarding the class of propositions in question as announcing probabilities, and somehow treating the announcements as probabilities are treated. What is about

to be said on the subject of probability is said, be it understood, with special reference to sequences of concrete phenomena.

When we infer delatively that this concrete B may have been preceded, or that there is a probability of its having been preceded, by concrete A, we may in the act of delation make explicit references to past instances of such sequence, and to the principle of continuity in nature. We may say that B has been known to follow A, and that therefore it would be in accordance with the settled order of nature for the B before us to have an A as its antecedent. But apparently it is not always, perhaps it is not commonly the case, that we reason thus explicitly. What we mostly seem to do is to merge the three ideas which in the argument are brought together—the ideas, namely, of nature's order in the past, of the continuity of nature's order, and of nature's order in the future—in the one idea of naturalness. The sequence of A and B, with which we are acquainted, presents itself to the mind as a natural sequence, and therefore as a sequence which may be looked for in the future. The circumstance of a concrete B following upon a concrete A, having once been noted, leaves, as it were, upon the mind an impression or picture of a natural connection between A and B. And when the explanatory antecedent of any new instance of B is sought, the mind, inevitably requiring to see before it something natural, turns to its past experience for a list of natural explanations.

The mind, when it thus acts delatively by implicit process, does not seem to be dependent only upon its own actual and definite experience for the conclusions which it draws. The impression of a natural sequence between A and B may apparently be due to other means. It may be to some extent created or enhanced by the accepted testimony of

other persons, and also by experience of sequences between phenomena allied to A and B. Nor must the power in this direction of meditation and imagination be overlooked. These supplements to, or substitutes for, actual and definite experience—and there may be others—giving rise to an impression of the naturalness of particular observed sequences, give rise in corresponding measure to apprehension of the naturalness or the probability of the recurrence of these sequences. So far as apprehension of particular probabilities is a real and not a merely theoretical apprehension, it seems to be dependent on impressions existing in the mind; and these impressions are, perhaps, in the great majority of cases partially derived from other sources than actual and definite experience. The term experience, however, may very well be employed, for general purposes, in a sense sufficiently wide to cover all these sources.

II. The twofold fact, that experience of sequences of concrete phenomena leaves upon the mind impressions of their naturalness, and that the mind can only expect and interpret the unknown in strict accordance with its impressions of what is natural, apparently supplies the key to the mental process of comparing and measuring probabilities of alternative events. We are accustomed to speak of the probability of one of several probable events being higher or greater than that of another. Of several alternatives, any one of which will answer expectation, we select one as having greater likelihood than all the rest. We look upon one event as having a priority of right to be expected, upon one interpretation of a phenomenon as having a priority of claim to be received as true.

Now what is the meaning of this expecting at the same time, with different degrees of expectation, a number of things of which we know that only one can happen, and of this interpreting in a number of ways, with different degrees

of confidence, an event of which, as we are well aware, only one of the interpretations can be true? Certainly the answer to this question seems to be, that what we really mean is this:—each of the events contemplated as happening, and each of the interpretations contemplated as being true, accords with some more or less strong or profound impression of naturalness already existing in the mind. The most probable event, and the most probable interpretation, is that which corresponds to the strongest of the mental impressions which experience has created. Any event, or any interpretation of an event, is expected, is regarded as probable, only because a picture of the event or interpretation, as constituting a part of the order of nature, already has existence in the mind. And it is according to the comparative vividness of the pictures answering to the several events or several interpretations that, while all of them are expected, yet the contemplation of one arouses greater intensity of expectation than the contemplation of another.

Probabilities, then, relating to alternative effects of a given cause, or alternative causes of a given effect, may be said to be ranged by the mind, or to be capable of being ranged when the need arises, in order of degree; their degree depending upon the strength of an impression created in the mind by past experience. Accordingly as the mind perceives with more or less keenness, and feels with more or less intensity, the naturalness of a contemplated circumstance, will it mark the probability of that circumstance as relatively high or low.

But, besides ranging probabilities of alternative circumstances in order of degree, it is to a certain extent both possible and convenient to assign numerical values to them. If a mental impression depended for its strength, or a mental picture for its vividness, only upon the number of separate

experiences, supposed to be all of the same impressiveness, that have gone to create it, and if this number could in every case be truly reckoned, then we should at once have the means of making definite numerical comparison between one probability and another. The material would be at hand for assigning to every probability a value which might afterwards represent its magnitude, without any explicit reference to the particular alternatives with which it had been compared. Now, although these definite and equal experiences, whose number can be reckoned, are not by any means the sole producers of mental pictures; although they are supplemented by unequal and unnumbered experiences, which may be shadowy and vague and scarcely present to the consciousness; yet they may, apparently, quite well be taken as representative experiences for the purpose of exhibiting the manner of the mind's dealing with them. As the mind deals, or appears to deal, explicitly with the things that it can explicitly count and measure, so we may not unreasonably suppose that it deals implicitly with the things that can only be implicitly assessed. Let us, then, assume, for the purposes of this exposition, that impressions are created only by equal and definite experiences whose numbers can be reckoned.

If records, or if memory, should tell us that B has taken place 100 times, and that on 20 occasions of its happening it has followed upon A, on 30 upon C, and on 50 upon D, then 20, 30, 50, represent respectively the numbers of elements of experience which have gone to make up the impressions in our minds of A, C, and D as the natural antecedents of B. And these numbers properly represent the proportionate probabilities of any new B having as its explanatory antecedent an A, or a C, or a D. If, however—as is frequently the case—we wish to confine our attention to the probability in favour of some one of the

antecedents, as A, we make use of a shorter method of exhibiting this. We designate the probability of A by a proper fraction, having as its numerator the number of instances of the particular antecedent, and as its denominator the number of instances of the one consequent. In saying that the probability in favour of A is $\frac{20}{100}$, we mean that there are in the mind 20 elements of experience of B being preceded by A, and 80 of its being preceded by something else, out of 100 elements of experience of its happening at all.

And now at this point it will be well just to notice another interpretation of the numerical value thus assigned to the probability of A. Instead of taking it to express the degree of natural expectation with which we look, on a given occasion, for one of a number of alternative phenomena, we may understand it as indicating the degree of frequency with which we may expect this particular phenomenon to happen in the future. Relying upon the continuity of nature, and upon the sufficiency of our experience, we may argue that, if in the past A has been the antecedent in 20 of 100 instances of B, the same proportion may be looked for in the future. Of every 100 instances of B about to happen, 20 may be expected to be preceded by A. This interpretation of numerical probability has, indeed, little or no direct bearing upon the subject of illation; but nevertheless it is one of which practical use is made, and of which some mention could scarcely be omitted here without an appearance of inadequate treatment of the subject of probability. It does not, however, seem to be at all necessary to our purpose that we should enter upon any further consideration of the question.

III. Having seen how numerical values are assigned to probabilities on a basis of experience, we may now proceed to notice another principle in accordance with which they are sometimes estimated. This principle is connected with our

ignorance. Because of what we are conscious that we do not know, as well as on account of what we have had experience of, we compare and measure the probabilities of events.

If, instead of being able to judge from the specific experience of similar sequences that a new instance of an effect B must have proceeded from an A, or a C, or a D, we know, from other considerations, that A, C, and D are the only possible antecedents, and know no more, then we attach to the respective probabilities in favour of A, C, and D values dependent on our ignorance. The causes that have given rise to concrete B may have acted under the form of concrete A, or of C, or of D. The mental picture arising from the contemplation of B preceded by A is neither more nor less vivid than the picture of B preceded by C or by D. Each is a new picture, and fits in equally well with pre-existing views of natural sequence and arrangement. Our expectation of one is consequently equal to our expectation of another. And if we choose to attach to our knowledge or sure expectation, that B has as its antecedent one of the alternatives, the numerical value 1, the value of the probability in favour of each separate alternative is necessarily $\frac{1}{3}$.

Examples of this may be given as follows. A train from London and a train from York arrive almost simultaneously at an intermediate station. If we should presently meet a traveller who must have arrived by one train or the other, and if, knowing no more than this, we should have occasion to consider the probability of his having come from the north, or from the south, we could only attach to either probability the value $\frac{1}{2}$. So again, if three trains leave Waterloo almost simultaneously, one for Bournemouth, one for Reading, and one for Ilfracombe, and we know of a certain person only that he has taken a seat in one of them, our estimate of the probability of his having gone to any particular one of the three places must be $\frac{1}{3}$. Whether we have to choose

between several possible causes of a given effect—as in the former case—or between several possible effects of a given cause—as in the latter case—we assign to the probability of each possible cause, or each possible effect, as its numerical value, a fraction having for its numerator 1, and for its denominator the number of causes, or of effects, between which choice has to be ignorantly made. In other words, we divide the value which represents knowledge into the given number of equal parts.

IV. Enough has now been said for our purpose concerning the explicit measurement of simple probabilities. It remains to point out to what a large extent the process of measurement, instead of being explicit, must really be implicit; and, besides being implicit, must be subjective also.

We have assumed in our discussion that the elements of experience, from which probabilities relating to any given question are derived, are of equal impressiveness, and capable of being counted and added together as separate units. With this assumption it is possible, in the manner shown, to assign numerical values to different probabilities. But without it it is manifestly impossible to exhibit their relative values with any accuracy, the mental impressions represented by the values not being properly commensurable. And perhaps it is in very few cases indeed that the assumption is justified by the facts of common life. Apparently it is but very seldom that our estimate of probabilities, though based on experience, is dependent solely upon our knowledge of instances that can be gauged and counted. In relation to the ordinary affairs of life impressions of natural sequences of concrete phenomena enter the mind from a variety of sources, with varying degrees of strength or weakness, and more or less consciously or unconsciously to ourselves. Besides the many real experiences which can be neither gauged nor counted, there are, recognition of sequences of allied pheno-

mena, the evidence of testimony, and the meditative and imaginative action of the mind, all introducing or confirming impressions concerning which it may be generally said, that the mind has no power, by any exercise of thought or memory, to subject them to an exact process of measurement and counting.

And yet the mind seems to be tolerably well aware of the relative vividness and intensity of its own impressions. Though it may be powerless to resolve them into their elements in order to give to them exact numerical values, yet it often has little or no difficulty in deciding that one is stronger or weaker than another. For practical purposes it seems for the most part to be able to range the chief probabilities that relate to any given event in an order of magnitude. Implicitly it decides between alternatives, though it cannot justify its decisions on explicit grounds.

Estimates of probabilities, besides being commonly implicit, are for the most part subjective also. That is to say, they vary with the individual thinker. An estimate may, indeed, be implicit without being in a special sense subjective, and subjective without being at all implicit. Thus, for example, the children of one family, or the boys of one school, having to a large extent been brought up under precisely similar influences, will have a number of common views, at once objective and implicitly arrived at, of the naturalness and probability of sequences of events. On the other hand, an individual, being aware of certain marked sequences of events affecting himself in a peculiar way, may be in a position to form an explicit estimate of probabilities based on a personal experience which differs from that of other men.

For the most part, however, the same causes that make estimates of probabilities implicit make them subjective also. The real experiences that cannot be gauged or counted, and the other instrumentalities, supplementary to real experiences,

by which impressions are produced, operate on different minds with very different degrees of frequency and force. No two persons can be said to have within them precisely the same material for estimating the probabilities in connection with any given event, except in the comparatively small number of cases in which the same experience is, so to speak, artificially supplied to both ; as, for example, in questions of probabilities founded on statistics. The comparative values which any person attaches to probabilities, in relation to the common affairs of life, are to a large extent dependent on his own individuality. They depend upon the nature and extent of his own personal experience. The valuation as a process is implicit ; as a result it is more or less subjective.

V. Butler, not much caring to maintain that the evidence in favour of religion amounts to more than very high probability, takes his stand on the sufficiency of high probability to determine conduct. He insists upon man's natural and reasonable obligation to let his actions be governed by considerations of what may happen. Now, although this subject of acting on probabilities is in strictness beyond the scope of our investigation, yet it lies so very near that the interest and importance of it may perhaps be thought to warrant its inclusion. Let us, then, make a short digression in order to examine it.

If a person, writing to a friend, thinks him more likely than not to have already left the country for his London house, he will naturally post the letter to his town address. Should the communication, however, have special reference to some matter which can be best attended to while his friend is still in the country, he may prefer to send the letter to his country house. If an invalid is told that a certain course of treatment will most likely improve his health, he will naturally consent to the adoption of the treatment. Should he learn, however, that the improvement, if effected, will be but

slight, while both the cost of the treatment and the suffering attendant on it will be considerable, he may reasonably choose to let it alone. If it appears more probable that a person, having caused an injury to another, did it maliciously than by accident, he will naturally be avoided as ill-disposed. Should it, however, be considered that the bad consequences of treating an accident as an offence far outweigh those of dealing with an offence as if it were an accident, he may be allowed what is called the benefit of the doubt, his injurious action being spoken of as simply a misfortune. If a merchant thinks that in a contemplated venture he is more likely to win than lose, he will naturally be disposed to undertake it. Should it, however, appear to him on reflection that the anticipated gain will be but small, while the possible loss may be considerable, he may wisely determine to renounce the venture.

The above examples seem each to illustrate two distinct principles, in accordance with which probabilities are employed for the regulation of conduct. The one principle is that which governs action when several alternative views of what has happened or will happen, or several alternative means to a given end, are presented for our choice. It is, that it is natural and reasonable to adopt that view, or that means, which has the greater probability in its favour. The second principle is introduced when the relatively good or evil consequences of acting on this or that view are brought before us, when, that is, alternatives are offered which are in one way or another means to different ends. It is, that it is natural and reasonable to adopt that view, or that means, in the case of which the probability of attaining the end gives, through multiplying by it the value of the end, the greatest product. If, for example, there is a probability of $\frac{1}{2}$ in favour of obtaining a good thing of the value 10, and a probability of $\frac{1}{3}$ in favour of obtaining one of the value 30, then,

the product in the former case being 5 and in the latter 10, it will be reasonable to make endeavour to obtain the latter. Let us briefly consider these two principles.

1. When we recognise that of two alternative events the probability in favour of one is greater than that in favour of the other, either we are consciously expecting the one on some given occasion with greater intensity than the other, or we believe that in a multitude of occasions the one will be found to happen more frequently than the other. But what—we have to inquire—is the mental connection between the action which we take on the given occasion and the superior strength of our expectation? or between action on this occasion and expectation which has reference to a number of occasions?

To the first question we may answer, that a connection is apparently to be found in the conception of naturalness. That event which we expect the more strongly is the event which accords with the stronger mental impression of what is natural. And if circumstances compel us to make definite choice between the two, that which is the more natural seems to become, for the time being, alone natural. There is a balance of expectation in favour of this one, a balance of feeling that it is to this one that the quality of naturalness belongs. But the quality of naturalness in circumstances and events is one which, in our conduct, we are under obligation to respect. There is constraint upon us to conform our behaviour to the ways of nature. And if a certain contemplated circumstance seems to us the natural circumstance to fill a gap in a group or series of events, we are apparently, when called upon to act upon some hypothesis in respect of the filling of this gap, under obligation to assume that it is the natural event that has happened or will happen, under constraint to base our conduct on the supposition that the order of nature has been or will be observed.

The motive just described, the constraint to act naturally by adapting conduct to the ways of nature, is perhaps the one by which we are commonly influenced when we choose, as the simple basis of action, the most probable of several alternatives. Nevertheless, if we look upon things in a larger way, we may find another ground for acting as we do. It appears to be the case, that the systematic choosing of the most probable alternative as the ground of action is the means by which conduct can, in the result, be brought into the greatest conformity with nature's ways. In a single instance of choosing the highest probability our conduct, though proper and natural as regards our motives, may prove to be mistaken as regards results. We may know that A is more likely to happen than C or D, and may act accordingly; and yet, after all, it may be C or D that happens. Our correct action may seem to end in failure.

If, however, we take a large number of instances, it seems to be the case that our systematic choice of A instead of C or D will be justified and rewarded by our obtaining the largest number of successes which it is in our power to obtain. We now look upon the probability as expressing the degree of frequency with which an event may be expected in the future; and in what has just been said we have the answer to our second question. To show what is meant, we need not, perhaps, travel beyond a very simple illustration. Let us suppose the probabilities in favour of A, C, D to be respectively $\frac{4}{8}$, $\frac{3}{8}$, $\frac{1}{8}$. That is to say, A is expected to happen 4 times, C 3 times, and D once, in 8 occasions of B. And let us suppose that action is taken on each of the 8 occasions without any knowledge of what happens on the other 7. We shall thus assimilate the conditions of this one simple case to the conditions of the congeries of different cases with which, in a given space of time, we have to deal in our course through life. If A is systematically chosen, a

correct choice will be made on 4 occasions out of 8. And it seems clear that this is the greatest number of correct choices which we have any ground at all for relying upon making. If our conduct is to be systematic and moral conduct, if it is to be regulated by principle, and not to be the sport of pure caprice, then, in dealing with probabilities that have relation to the same event, the system and principle by which it will be brought, as regards its results, into closer touch with nature than by any others, appear to be those of always acting on the probability which is numerically the highest.

2. We have now to examine the complex case of choosing between several probable events, as grounds of action, when each has a different amount of good contingent on it. We have to consider the rationale of acting, as we often do, on a lower probability because associated with it is a greater good. "In deliberations concerning conduct," says Butler, "there is nothing which reason more requires to be taken into the account, than the importance of it. For, suppose it doubtful what would be the consequence of acting in this, or in a contrary manner; still, that taking one side could be attended with little or no bad consequences, and taking the other might be attended with the greatest, must appear to unprejudiced reason of the highest moment towards determining how we are to act."¹ If, as before, the probabilities of A, C, D are $\frac{4}{8}$, $\frac{3}{8}$, $\frac{1}{8}$, and if we suppose the gains contingent on the respective events to be £8, £16, £24, the products, already spoken of, are £4, £6, £3. We select accordingly for the basis of action the second of the three alternatives. But on what rational ground is it that we do so?

It seems here to be the case that, if we were to look upon our choice as an isolated act, we could plead no rational justification for the course we take. In an act of choosing,

¹ *Analogy of Religion*, Part II. ch. vii.

considered by itself, we should be under moral obligation to select the most probable or natural event, without reference to the smallness of the gain contingent on it. No contingent advantage, however great, associated with a less probable event, would make it lawful for us to base our action on a lower probability. If, however, our act of choice is regarded as one of a series of like acts regulated by principle, then it becomes proper for us to take as our guide the products of probability and contingent good. For thus, apparently, we put ourselves in the way of obtaining in the long-run the greatest amount of good which it is in our power to make reasonably sure of. By systematically choosing C as the basis of action on each of the 8 occasions of the happening of B, we may reckon—supposing ourselves, as before, to be at the time ignorant of what happens on the other 7—upon choosing 3 times the event that does actually take place, and upon gaining a sum of £48; whereas by choosing A, although we should make a correct choice on 4 occasions, yet our gain would be but £32, and by choosing D, although whenever we were right we should gain £24, yet only once would this event take place. This simple instance seems to illustrate sufficiently well for the purposes of our digression the meaning of the rule to be observed in choosing between different probable events, having different degrees of advantage contingent on them, in connection with the manifold affairs of common life. So far as the acquisition of good of any kind is an end of conduct, and so far as different degrees of good are with different degrees of probability within our reach, it is incumbent upon us on every occasion to take that course which is associated with the greatest product of probability and advantage; because on the whole we may thus expect to obtain the greatest total amount of good which it is in our power to secure.

VI. Let us now consider, in immediate preparation for the

following chapter, the question of the cumulation of probabilities. If the happening of B makes A probable, and the happening of another event E likewise makes it probable, then—and the thought is one with which we are familiar—when B and E are both found to happen, the probability of the happening of A is considerably enhanced. If, for example, pains in the head are a not uncommon symptom of influenza, and depression of spirits another symptom, we are aware, in the case of both being present, that the probability of the illness being influenza is greater than if either of them was not apparent. Our concern in this section is with the enhanced probability, calculated after the ordinary method of the theory of probability, of a conjectured event, which may be to each of several given events an antecedent or a consequent. It will, however, be sufficient to consider only the case of a conjectured antecedent.

Let us suppose that, when a certain boy has had a cold, it has been known 4 times out of 10 to proceed from bathing; and that, when he has hurt his foot, it has once out of 3 times been done in bathing. On the next occasion, then, in which he has a cold the probability that he has been bathing is $\frac{4}{10}$; and on the next occasion of injuring his foot the probability of his having bathed is $\frac{1}{3}$. If these two misfortunes are seen to affect him simultaneously, the probability that he has been bathing is greater than $\frac{4}{10}$, and greater than $\frac{1}{3}$; and we proceed to ascertain what its numerical value is.

The full mathematical process of obtaining the required fraction is as follows. The probability that the cold came from bathing is $\frac{4}{10}$; that it did not come from bathing is $\frac{6}{10}$; that the injured foot came from bathing is $\frac{1}{3}$; that it did not come from bathing is $\frac{2}{3}$. The probability, then, that both came from bathing is $\frac{4}{10} \times \frac{1}{3}$ or $\frac{4}{30}$; that the cold did but the injured foot did not is $\frac{4}{10} \times \frac{2}{3}$ or $\frac{8}{30}$; that the cold

did not but the injured foot did is $\frac{6}{10} \times \frac{1}{3}$ or $\frac{6}{30}$. Hence the probability that one or both of the boy's misfortunes came from bathing, that is, that he did bathe, is $\frac{4}{30} + \frac{8}{30} + \frac{6}{30}$ or $\frac{18}{30}$; a fraction greater, as was said, than $\frac{4}{10}$, and greater than $\frac{1}{3}$. The probability, it may be added, that neither misfortune came from bathing is $\frac{6}{10} \times \frac{2}{3}$ or $\frac{12}{30}$; the difference, it will be observed, between unity and $\frac{18}{30}$.

What, now, is the meaning of our numerical result? It is as follows. We are contemplating 30 separate occasions on which the boy has had both a cold and an injured foot. On 12 of these, by the supposed conditions of the problem, his cold has arisen from bathing, and on 18 it has not. Out of the 12, by the supposed conditions of the problem, there are 4 on which the accompanying injury to the foot was likewise the result of bathing, and 8 on which it was not. Out of the 18, when the cold did not arise from bathing, there are, by the supposed conditions of the problem, 6 on which the hurt foot did thus arise, and 12 on which it did not. Thus we have 4 occasions on which both mishaps were caused by bathing, 8 on which the first alone, and 6 on which the second alone, was thus caused, and 12 on which bathing did not account for either. In connection with 18 out of the 30 past occasions aforesaid there was an act of bathing, in connection with the remaining 12 there was none. Hence the probability of his having now bathed, or the degree of expectation with which we look to an act of bathing as being the true explanation of one or both of the new instances of misfortune that have come before us, is $\frac{18}{30}$. The bathing which is considered to account at the same time for both the instances may be—let it be carefully observed—either a single act, or two separate acts having the common name.

We have now to notice two important points. The first is, that in cumulating probabilities we cannot, in general,

do otherwise than depart from the results of genuine experience, and introduce into our conclusions new elements of doubt. In the above example, we started with the supposition that we had known 10 instances of the boy's suffering from cold, in 4 of which we further knew him to have bathed; and with the supposition that we had known 3 instances of his suffering from an injured foot, in 1 of which he had previously been bathing. We did not by any means know him to have either a cold or an injured foot on all the 30 occasions assumed in the process of cumulation. Nor, if we admit that he has suffered from either misfortune 30 times, are we justified in assuming, either (1) that bathing has been its origin throughout in the same proportion as that of which we have cognisance, or (2) that the 30 occasions of cold and the 30 occasions of injured foot have been coincident. To what extent the result is vitiated by these assumptions it is impossible to say. But certainly the conclusion cannot be taken to represent exactly a probability based upon genuine experience.

The second point is as follows. It is not difficult to see that, the greater the number of independent circumstances brought together in evidence of an event, the higher is the resultant probability in its favour. This probability may be expressed as the difference between unity and the product of the several probabilities against the event. And, since this product of proper fractions of course diminishes as the factors increase in number, the difference aforesaid, or the probability of the contemplated event, correspondingly increases. The result in question seems thus far to be not discordant with the teachings of experience: we are quite accustomed to consider that, the larger the amount of independent evidence that can be heaped together, the more nearly certain is it that the event has happened.

But now we must go on to notice that, with the increase

of evidence, the assumptions which are made in the mathematical process of cumulating probabilities depart more and more widely from genuine experience. There is a greater quantity of separate events in respect of which we have to assume, that the rate of frequency with which they occur is continuously the same through periods other than those of which we have experience. And we have to assume, in general, a larger number of occasions on which we have had experience of this greater quantity of events all happening together. The nearer, then, the calculated probability, based on assumptions, approaches certainty, the more extravagant are the assumptions which are a basis of the calculation.

In particular, the assumption which the mind is called upon to make, that, the more numerous are the separate but concurrent circumstances testifying to a conjectured fact, the more familiar to it is this combination of them, is so violent, so contrary to all experience, that it cannot for a moment be supposed that the mind, working implicitly, ever makes it. It is manifestly the case in real life that, the greater the number of independent circumstances noticed as all happening together, the more unusual is their combination taken to be, the less experience has the mind already had of such concurrence. And since the exact opposite of this truth is involved in the theory of cumulating probabilities, it cannot for a moment be allowed that the mathematical process is that which the mind really follows, when it becomes convinced, through a multiplicity of evidence, and by implicit action, that a very high probability exists of the truth of a supposed event. Further, we apparently have, in the consideration here adduced, strong ground for refusing to accept the view, that through a cumulation of probabilities actually carried out by explicit process assured conviction can ever be attained.

CHAPTER XV.

PROBABILITY AND ILLATION.

I. WE are now coming to what may be called the climax of this treatise. It is the point at which, in the first place, Mill's claim to have treated, in his exposition of induction, of every kind of inference will be finally disposed of. And it is the point at which, in the second place, the presentment of the method of illation will be substantially completed. When these two purposes have been effected, though the argument will still be in some respects unfinished, yet its main issue will have been determined. There will still be need, in another chapter, to amplify and consolidate the considerations urged; but practically the position will have been established. The inutility of logic to lead to or explain the discovery of causes and effects in the field of history will have been made conspicuous, and the adequacy of illation to do the required work will, it is hoped, have been exhibited to the satisfaction of the reader.

With regard to Mill, the special point which in this chapter has to be examined is his contention, already noticed in Chapter VII., that concrete facts of common life are ascertained by induction through the instrumentality of probable conclusions. In his treatment—if, indeed, his comparatively few remarks are worthy of the name—of probable evidence as a ground of assent and guide to conduct he writes as follows :—

"In our inquiries into the nature of the inductive process, we must not confine our notice to such generalisations from experience as profess to be universally true. There is a class of inductive truths avowedly not universal, in which it is not pretended that the predicate is always true of the subject, but the value of which, as generalisations, is nevertheless extremely great. An important portion of the field of inductive knowledge does not consist of universal truths, but of approximations to such truths; and when a conclusion is said to rest on probable evidence, the premisses it is drawn from are usually generalisations of this sort.

"As every certain inference respecting a particular case implies that there is ground for a general proposition, of the form, Every A is B; so does every probable inference suppose that there is ground for a proposition of the form, Most A are B; and the degree of probability of the inference in an average case will depend on the proportion between the number of instances existing in nature which accord with the generalisation, and the number of those which conflict with it."¹

"If we would succeed in action, we must judge by indications which, though they do not generally mislead us, sometimes do; and must make up, as far as possible, for the incomplete conclusiveness of any one indication, by obtaining others to corroborate it. The principles of induction applicable to approximate generalisation are therefore a not less important subject of inquiry than the rules for the investigation of universal truths, and might reasonably be expected to detain us almost as long, were it not that these principles are mere corollaries from those which have been already treated of."²

"We know only that most A are B, not why they are so, nor in what respect those which are, differ from those

¹ Bk. III. ch. xxiii. § 1.

² Id. § 2.

which are not. How then did we learn that most A are B? Precisely in the manner in which we should have learnt, had such happened to be the fact, that all A are B. We collected a number of instances sufficient to eliminate chance, and having done so, compared the number of instances in the affirmative with the number in the negative. The result, like other unresolved derivative laws, can be relied on solely within the limits not only of place and time, but also of circumstance, under which its truth has been actually observed; for as we are supposed to be ignorant of the causes which make the proposition true, we cannot tell in what manner any new circumstance might perhaps affect it.”¹

It will be observed that in the above passages Mill recognises two steps in the mental passage from the known to the unknown in relation to the affairs of common life. The first is that in which approximate generalisations, applicable to new cases, are arrived at; the second is that in which the mind so combines them as to make some near approach to the ascertainment of concrete truth. But what light does he throw upon either of these steps or processes? He speaks of approximate generalisations, or probable evidence, as examples of inductive truth, and at the same time as derived from examining a number of instances sufficiently large to eliminate chance. He speaks of practical conclusions being based on a number of such generalisations. And he speaks of the principles of induction applicable to approximate generalisation—referring, it may be to the derivation, it may be to the employment, of approximate generalisations or probable conclusions—as corollaries of others already treated of.

In the case of the first step there appears to be an almost entire absence of real explanation of the mind's action. With regard to it we may simply put these inquiries. First, what

¹ Bk. III. ch. xxiii. § 4.

is meant by collecting a number of instances sufficient to eliminate chance? Secondly, whatever it is, how can it, together with an act of counting, be spoken of as an example of induction? Thirdly, of what principle already treated of can the principle of this process be regarded as a corollary? In the absence of clear and satisfactory answers to these questions—and none such appear to be forthcoming—we are surely entitled to say, that Mill fails to show that approximate generalisations applicable within certain limits to new cases are, as he considers them, inductive truths.

And the second step is similarly, and perhaps even more unjustifiably, assumed to require no full consideration. His treatment of it is scanty and inadequate in the extreme, besides being, as will presently appear, quite erroneous. Further, he makes no attempt, or no serious attempt, to exhibit it as an instance of induction, or its principle as a corollary of any principle already treated of. The following is what he has to say on “making up, as far as possible, for the incomplete conclusiveness of any one indication by obtaining others to corroborate it.”

“From the application of a single approximate generalisation to individual cases, we proceed to the application of two or more of them together to the same case.

“When a judgment applied to an individual instance is grounded on two approximate generalisations taken in conjunction, the propositions may co-operate towards the result in two different ways. In the one, each proposition is separately applicable to the case in hand, and our object in combining them is to give to the conclusion in that particular case the double probability arising from the two propositions separately. This may be called joining two probabilities by way of Addition; and the result is a probability greater than either. The other mode is, when only one of the propositions is directly applicable to the case, the

second being only applicable to it by virtue of the application of the first. This is joining two probabilities by way of Ratiocination or Deduction ; the result of which is a less probability than either. The type of the first argument is, Most A are B ; most C are B ; this thing is both an A and a C ; therefore it is probably a B. The type of the second is, Most A are B ; most C are A ; this is a C ; therefore it is probably an A, therefore it is probably a B. The first is exemplified when we prove a fact by the testimony of two unconnected witnesses ; the second, when we adduce only the testimony of one witness that he has heard the thing asserted by another. Or again, in the first mode it may be argued that the accused committed the crime because he concealed himself, and because his clothes were stained with blood ; in the second, that he committed it because he washed or destroyed his clothes, which is supposed to render it probable that they were stained with blood. Instead of only two links, as in these instances, we may suppose chains of any length. A chain of the former kind was termed by Bentham a self-corroborative chain of evidence ; the second, a self-infirmative chain.

“When approximate generalisations are joined by way of addition, we may deduce from the theory of probabilities laid down in a former chapter, in what manner each of them adds to the probability of a conclusion which has the warrant of them all.

“If, on an average, two of every three A's are B's, and three of every four C's are B's, the probability that something which is both an A and a C is a B, will be more than two in three, or than three in four. Of every twelve things which are A's, all except four are B's by the supposition ; and if the whole twelve, and consequently those four, have the characters of C likewise, three of these will be B's on that ground. Therefore, out of twelve which are both

A's and C's, eleven are B's. To state the argument in another way: a thing which is both an A and a C, but which is not a B, is found in only one of three sections of the class A, and in only one of four sections of the class C; but this fourth of C being spread over the whole of A indiscriminately, only one-third part of it (or one-twelfth of the whole number) belongs to the third section of A; therefore a thing which is not a B occurs only once among twelve things which are both A's and C's. The argument would, in the language of the doctrine of chances, be thus expressed: the chance that an A is not a B is $\frac{1}{3}$, the chance that a C is not a B is $\frac{1}{4}$; hence if the thing be both an A and a C, the chance is $\frac{1}{3}$ of $\frac{1}{4} = \frac{1}{12}$." ¹

Mill, then, having asserted that cumulation or addition of probabilities is employed in certain given circumstances, and having put before us an abstract sample of the process of addition, apparently considers that he has done enough to show how in these circumstances induction is the "logic of practical business and common life." The following to its close the argument commenced by cumulating probabilities he commits to our own unaided efforts. He leaves us to discover for ourselves, not only how the reasoning supposed to be employed is an instance of induction, but also what the precise course of reasoning is. To an examination of this latter question let us, starting from the point at which approximate generalisations or probable conclusions are assumed to be applicable to the case before us, now address ourselves.

II. In the first concrete instance alluded to by Mill—that of proving a fact by the testimony of two independent witnesses—evidently what we have first to do is to assess the probability, in either case, that truth is being spoken, and then combine, in the way of cumulation, the two pro-

¹ Bk. III. ch. xxiii. § 6.

babilities. This, he implies, will give us the probability that the fact, which they agree in testifying, is true. Taking, then, the letters and figures of the abstract example, if the probability of A speaking truth is $\frac{2}{3}$, and that of C speaking truth is $\frac{3}{4}$, we have $\frac{11}{12}$ as the probability that either A, or C, or both A and C are speaking truth; or—as it might at first sight appear—that the fact attested may somehow be relied upon as true.

In the second instance—that of inferring the guilt of an accused person—we apparently have to argue thus. Two out of every three persons who conceal themselves, and three out of every four whose clothes are stained with blood, have committed crime. Whence the probability, that a person who both conceals himself and has blood-stained clothes has committed crime, is $\frac{11}{12}$.

Let us now carefully and critically examine these two results.

With regard to the first, we may begin by noticing the important point, that in the given circumstances the calculation of probability is not correct. The fraction arrived at is manifestly the probability that, if the two witnesses are testifying each to his own fact, one or the other, or both together, of the facts attested will be true. The complete change of conditions occasioned by the hypothesis, that their testimony is the same, is altogether overlooked or disregarded. If both are asserting the existence of the same thing, then, relatively to the existence of this thing—which is the point in question—one cannot be speaking truly, while the other lies. There are but two alternatives to consider, namely, that both are speaking truly, and that both are speaking falsely. Hence we have but one case, instead of three, in which truth will be spoken. And the probability of this one case happening is $\frac{2}{3} \times \frac{3}{4}$ or $\frac{6}{12}$, a probability, let it be observed, actually less, instead of greater,

than the probability of the truth of the alleged fact when testified to by either A or C alone. The cumulation of probabilities diminishes, instead of increasing, the probability that the thing declared is true. The greater the number of witnesses, all asserting the same thing, the less is their concurrent testimony to be accepted.

This seems perhaps to be a strange result. But in truth—and herein the easy explanation lies—it is not in consequence of the value assigned to testimony by any theory of probability that things attested by one or more witnesses take their place in our minds as established facts. It is not really thus that we come to look upon alleged facts as satisfactorily substantiated. With regard to this point it may suffice to refer the reader to the discussion of testimony at the close of Chapter XI., and to quote from Mill the following passage.

“It is obvious, too, that even when the probabilities are derived from observation and experiment, a very slight improvement in the data, by better observations, or by taking into fuller consideration the special circumstances of the case, is of more use than the most elaborate application of the calculus to probabilities founded on the data in their previous state of inferiority. The neglect of this obvious reflection has given rise to misapplications of the calculus of probabilities which have made it the real opprobrium of mathematics. It is sufficient to refer to the applications made of it to the credibility of witnesses, and to the correctness of the verdicts of juries. In regard to the first, common sense would dictate that it is impossible to strike a general average of the veracity, and other qualifications for true testimony, of mankind, or of any class of them; and even if it were possible, the employment of it for such a purpose implies a misapprehension of the use of averages: which serve indeed to protect those whose interest is at stake against mistaking the general result of large masses of instances, but are of

extremely small value as grounds of expectation in any one individual instance, unless the case be one of those in which the great majority of individual instances do not differ much from the average. In the case of a witness, persons of common sense would draw their conclusions from the degree of consistency of his statements, his conduct under cross-examination, and the relation of the case itself to his interests, his partialities, and his mental capacity, instead of applying so rude a standard (even if it were capable of being verified) as the ratio between the number of true and the number of erroneous statements which he may be supposed to make in the course of his life."¹

Let us now take up the second of Mill's two concrete instances. The probability, we find, that a person who both conceals himself and has blood-stained clothes has committed crime is $\frac{1}{12}$. This, when we look into it, is the probability that he is guilty of one of three things, either (1) of a crime which leads him to conceal himself, or (2) of a crime which is a cause of his clothes being stained with blood, or (3) of two crimes, or one crime, having as their outcome the joint result. But if we take—as Mill perhaps intends us to take, and as in such matters we commonly do take—the two incidents as mutually corroborative indications of one and the same crime, the third of the alternatives just mentioned is the only one with which we are concerned. And the probability that the accused person is a criminal in this restricted sense we find to be much less than the probability that he is a criminal in the wider one. The probability that he has committed either one crime, or two crimes, of which both the concealment of himself and the condition of his clothes are to be taken as results, is only $\frac{2}{3} \times \frac{2}{3}$ or $\frac{4}{9}$, a probability less than that of his having committed a crime indicated by either piece of evidence taken

¹ Bk. III. ch. xviii. § 3.

singly. And the probability that it is one crime, and not two, from which the joint results proceed, is of course something smaller still. The cumulation of facts supposed to be accounted for by one and the same crime diminishes the probability of such a crime having been committed.

Here again we may seem to have reached a conclusion which contradicts experience. But here, as before, it may be remarked that the explanation lies in the consideration that it is not—at all events in any great measure—by means of, or in accordance with, any theory of probability that the mind attains assurance of facts through circumstantial evidence. Apart from the futility, just exposed, of the method of probability for discovering the kind of fact which will account for a number of given circumstances, there is another step for which it makes little or no provision. It provides no means, or no regular means, of fitting a definite cause to a definite effect. Let the probability that a certain person is a criminal be what it may, by what manner of dealing with probabilities are we to connect him, as Mill would have us do, with *the* crime which is supposed to have been committed? There appears to be, in general, in the theory of probability no way of attaching even a known criminal to a known crime of precisely the same kind as that which he is known to have committed. If it is certain that A has recently committed murder, and if it is certain that B has just been murdered, on what ground can it, in general, be said to be probable that A has murdered B? If A can for any reason be fixed upon as one of a limited number of possible perpetrators of the deed, then there is material for drawing probable conclusions, and the mind may attempt to estimate the probability of A being the murderer, if it chooses to do so. But in the absence of this condition, if not in its presence also, it associates criminal

with crime by means of a process for which the theory of probability has no place.

Let us now sum up. It is certain, we may say, that in the actual working of the mind, in relation to the concrete affairs of common life, a large body of circumstantial evidence pointing together to one common fact produces a strong disposition to assent to that fact. And the greater the number of separate indications, the stronger is the claim to acceptance of the fact indicated felt to be. And it is certain, we may say, that in the cumulation of probabilities by mathematical process a large body of circumstantial evidence pointing together to one common fact leads, in the first place—as was shown at the end of the preceding chapter—only to results depending on assumptions such as the mind cannot reasonably be supposed to make, and leads, in the second place, to probabilities actually decreasing in value with the increase in number of evidential circumstances. Although, therefore, mathematicians may, in estimating the value and weight of evidence, choose to treat all men and things as subjects of statistics and numerical probabilities—thus producing results opposed to human experience—yet it must be maintained that the working of the minds of ordinary men proceeds on quite different lines. When the mind is looking at things naturally, increase in a body of convergent evidence brings with it increase of vivid realisation, and also increase of assurance: when it is following the unreal guidance of the theory of probability, its power of realising and affirming the conclusions which it reaches becomes less as the evidence on which they are based becomes more abundant. The theory of probability, interesting though it is, and in its measure true, is quite unequal to dealing with the concrete problems of common life.

And not alone for the twofold reason just described is the

inadequateness of the theory of probability to be condemned. It is to be condemned also for the reason that, however high may be the probability that a particular effect of a certain kind has been produced, and that a particular cause of a corresponding kind has operated, it provides in general no means of connecting the particular cause with the particular effect. Thus it fails, in general, to lead even to low probabilities of definite concrete truths.

III. Let it now be our business to observe, how that which has been set forth in this book as the process of illation is free from the defects that have just been spoken of. Let it be our business to observe, how that which has been presented as the course which the mind naturally and commonly pursues in discovering concrete causes and effects is a course which avoids the insuperable difficulties of the method of probability. We have to notice, in the first place, how the mind, starting with probable conclusions concerning circumstances that have come before it, so deals with them that it gathers vividness of realisation and firmness of assurance from their increasing number. And we have to notice, in the second place, how it contrives to bridge the gap between an ascertained or conjectured cause and an ascertained or conjectured effect. It will simplify the discussion if we consider only the method of finding causes of effects: that of finding effects of causes is in principle the same.

In illation, then, having a number of concomitant effects before us, we do not make any attempt to calculate the degree in which it would accord with our experience for them all to be the effects of a certain set of causes acting, singly or conjointly, under a common name. We do not, that is, search for a kind of cause known by experience to be a probable antecedent of each effect, and, having found one, calculate the probability of all the effects having proceeded independently each from a cause of this common kind. To do this is

the method of probability, which, whatever other uses it may have, is of little or no value in tracing the concrete causes of concrete effects. But, associating together the concomitant effects, we provisionally assume that they are the products of one common cause—not, be it observed, of causes having a common name, but of one and the same compound cause. We then proceed to ascertain by reference to experience what kind of thing this common cause must be. Having before us the probable or alternative antecedents of each of the effects, we eliminate all antecedents that are not common to all the effects, and we conclude that those which remain are each of them alternative kinds of concrete cause of the whole body of effects. Let us, for example, take Mill's instance of a person concealing himself and having blood-stained clothes. A man's concealing himself has crime, and other things which we may speak of as ABC, as its alternative antecedents. The condition of his clothes has crime, and ADE. Assuming, then, that the two circumstances proceed from some common cause, we find that this must be, either crime or A; these being the only two common kinds of alternative or probable antecedent.

Now if we fix our attention upon one of the alternative kinds of cause, say crime, it seems tolerably evident that—at all events, in general—the larger the number of separate effects of which it is taken to be an explanatory cause, the more lively will be our realisation of it as accounting for them. A person who hides himself and has blood-stained clothes may be a person who has committed a murderous assault. He has marks of the murderer about him; but they are at the same time marks which we could without much difficulty associate also with innocent proceedings. But a person who, besides having these marks, should be found to have mysteriously absented himself from home, to have returned with valuable articles in his possession, and to carry on his person

traces of a struggle, would stand out somewhat conspicuously from other men as having been engaged in an unlawful deed. The multiplicity of convergent details would create an impression of a murderous attack, which it would be comparatively hard to banish from the mind. A number of effects assumed to proceed from the same source, and then found to be harmoniously explicable by some kind of common cause, found to be mutually dependent and explanatory parts of one composite whole, present a picture which, up to the point of its becoming substantially complete, is rendered vivid in proportion as the number of contributory effects is great. In the method of probability—as we have seen—that a number of concurrent effects should all have their origin in certain causes acting under a common name, is a conjectured event which, from want of experience of instances of similar concurrence, the mind cannot be properly said to realise and expect. But in the method of illation that a number of concurrent effects should all proceed from one explanatory cause, is a conjectured event which, owing to the picture of a composite whole consistently and harmoniously built up, impresses itself on the mind as one deserving of careful and attentive thought.

Our next point is the enhancement of assurance occasioned by an increased multiplicity of effects. It will at once be obvious that, in general, the greater the number of independent effects all proceeding from one compound cause, the fewer are the alternative kinds of cause from which they can all alike proceed. With the introduction of new effects or circumstances, claiming to spring from the same cause as those already under observation, some of the common antecedents already ascertained will, in general, have to be eliminated. And thus, up to the point of the elimination of all but one, the number of alternative kinds of cause becomes continuously less, and our limits of choice con-

tinuously restricted. And if, by introducing new effects, we can succeed in eliminating all but one, then the mind is tolerably well assured that it has found in this one the kind of cause which contains the true explanation of the combined effects.

We pass on to the second main question, that, namely, of bridging the gap between an ascertained or conjectured kind of effect and an ascertained or conjectured kind of cause. Let us suppose ourselves to be more or less convinced that A has committed a murderous assault, and that B has met with a violent death. The method of probability has, in general, no way of bringing these two conclusions into connection with each other, so as to make it probable, in any practical sense of the term, that A is the murderer of B. In illation, however, the mind can assume provisionally that the two ascertained or conjectured kinds of fact are causally related, and upon finding a hypothetical definite fact—not discordant with other known facts—which may represent at once the act of A and the fate of B, can give its assent to this fact as true. The provisional assumption is justified by some observed contiguity between A and B, or between the two sets of circumstances that have established, conjecturally or certainly, the nature of the act of the one and of the fate of the other. And its assent to the specific proposition, that A has murdered B, is justified by the causal explanation afforded by this inferred definite fact of the two sets of convergent circumstances.

We have yet to consider the important questions of the value of the assent thus given, and of the perception by the mind of alternative solutions of a given problem. But these we may reserve for another chapter, concluding for the present with a brief general description of the nature of the assent of illative inference. The assent of illative inference is assent given to a proposition which satisfies and sets

at rest the mind when, in the light of past experience of sequences of concrete phenomena, it is investigating causes and effects in the field of history. It is assent given to a proposition which satisfies the mind by explaining and reducing to order a multitude of facts otherwise chaotic and unintelligible. And it is assent given to a proposition which explains and reduces to order a multitude of facts by presenting them as causally connected one with another, and constituting together one complete and definite scene; a scene fitting into, and harmonising with, some part of the great body of historical pictures that already have existence in the mind.

CHAPTER XVI.

ASSENT AND BELIEF.

I. IF further argument were needed to show that it is not through cumulation of probabilities that assent to facts of history is reached, the nature of the assent in question might be adduced. For there is, apparently, in the full assent given to propositions thoroughly established by a multiplicity of concurrent and convergent circumstances an element which no theory of probability can properly account for. And yet Newman refers to this very element in support of his view, that "a proof is the limit of converging probabilities." He writes as follows:—"It may be added, that, whereas the logical form of this argument is, as I have already observed, indirect, viz., that 'the conclusion cannot be otherwise,' and Butler says that an event is proved, if its antecedents 'could not in reason be supposed to have happened *unless* it were true,' and law-books tell us that the principle of circumstantial evidence is the *reductio ad absurdum*, so Newton too is forced to the same mode of proof for the establishment of his lemma about prime and ultimate ratios. 'If you deny that they become ultimately equal,' he says, 'let them be ultimately unequal;' and the consequence follows, 'which is against the supposition.'"¹

Let us, then, examine this position, that in illative inference the form which certitude virtually takes is, The conclusion

¹ Ch. viii. § 2.

cannot be otherwise. We may admit that it is a sound position, and we may accept the following words as a correct description of it:—"The language in common use, when concrete conclusions are in question, implies the presence of this personal element in the proof of them. We are considered to feel, rather than to see, its cogency; and we decide, not that the conclusion must be, but that it cannot be otherwise. We say, that we do not see our way to doubt it, that it is impossible to doubt, that we are bound to believe it, that we should be idiots if we did not believe."¹ What we have to do is to inquire, on what ground it is that we thus shrink and recoil from the negative of the conclusion which offers itself to us for assent, and whether it is a ground which the theory of probability can be said to recognise.

Often, of course, it will be the case that the mind discerns alternative solutions of the same problem. In the first place, starting with one or two phenomena of which it seeks to ascertain the cause, it may be led to different conclusions by tentatively associating with them, as concurrent effects, different groups of neighbouring phenomena. In the second place, starting with some definite group of associated phenomena, it may find more than one common kind of cause from which all might have proceeded. And in the third place, starting with some one kind of cause as having produced them all, it may find more than one definite operating cause whose effect this kind of cause may be taken to be. There is thus, it will be seen, in illative inference regarded broadly, abundant room for diversities of conclusion respecting the definite concrete origin of this or that concrete effect; and it may well be that some of the conclusions are mutually inconsistent.

When alternative solutions are thus present to the mind,

¹ Ch. viii. § 2.

judgment as to their absolute truth or falsity is of course suspended. Assent may be given to each and all as conclusions which are probably true, but here assent must stop. No apparent explanation of the phenomenon or phenomena in question can be rejected as untrue; and none, in the presence of satisfactory alternatives, can be accepted as the true one. Suspense of judgment, however, does not involve paralysis of action. For one alternative conclusion may appear to the mind more probable than all others. It may be felt to explain more facts, or to explain facts in closer accordance with past experience, and thus be one on which, no less than if it were without competitors, action can reasonably and properly be grounded.

And if, as may often be the case, no more than one explanation is present to the mind, and yet the mind is conscious that some other may exist, judgment must, apparently, still be kept suspended. An inferred event, offering itself as a sufficient explanation of observed phenomena, only because no other has yet been found, is an event of which, in strictness, it is but the very high probability that is inferred.

Of assent proper—assent to the one conclusion which explains all, or nearly all, the phenomena needing explanation—there seem to be three forms, or three stages, between which we may distinguish.

First, we have assent to a conclusion which the mind, consciously or unconsciously, assumes to be the only one that has any claim to be considered. Here the mind simply takes, as it were, the new fact made known to it by inference, and sets it in the place into which it fits in the orderly picture of the world which is in process of construction. It is a fact which is accepted as true and received into the mind because, while it is itself in substantial harmony with the impressions of experience, other scattered

images of outside things—the things which are the evidential facts on which assent is based—are seen to be capable of being ranged around it, and by its instrumentality made, together with it, orderly and intelligible parts of the growing representation. If this is at all a correct description of the mental operation of simple assent, it is plain that the operation is quite unconnected with estimates and calculations of probability.

Secondly, assent may be explicitly given to a conclusion on the ground that it, and it alone, affords the explanation that is required. This event—so the argument runs—must be true, because there certainly is no other event, in any degree probable, to dispute its claim. Now here, it may with reference to Newman's view be to some extent admitted, there is a semblance of assent being based upon the limit of probability. The quantities, says Newton, in effect, in his lemma, must be ultimately equal, they cannot be otherwise than equal, because, by hypothesis, there is no room for any finite quantity to come between them. And with some similarity of reasoning we may say, in the case of assent, that the probability of this event must be equivalent to certainty, that we cannot conclude otherwise than that it is true, since there is, by hypothesis, no other probability to detract from its numerical value. If in illation it were indeed the case, that probability develops into certainty with the gradual disappearance of competing probabilities, then assent would, apparently, be given in the form, The conclusion cannot be otherwise. But the converse of this does not follow. It does not follow that the one conclusion to which, for some reason, assent is obviously restricted—and which therefore cannot become other than it is—is in any way connected with considerations of probability.

But thirdly, the words, The conclusion cannot be otherwise, may have a different meaning from that just pointed

out. This, while it is the meaning which Newman really attaches to them, is a meaning quite foreign to the argument of Newton's lemma. If a person, having assented to a proposition on the explicit ground of there being no alternative proposition demanding to be considered, should interrogate himself, or be interrogated, as to why, even so, he feels called upon to give assent, he could, apparently, only make answer to the effect, that with all the evidence that has been brought forward in its favour it cannot be otherwise than true. And the real meaning of such an answer appears to be as follows. A healthily active mind ardently seeks for explanations of phenomena that come before it. It has an eager desire to ascertain causes of effects and effects of causes, and a keen interest in learning how cause is linked with cause and effect associated with effect in the field of history. It is continually employed in ranging facts in orderly sequence and connection, and building up for itself a harmonious and consistent representation of the external world. And thus, to find a causal explanation of a multitude of hitherto unexplained phenomena, is for it a satisfaction which it feels it to be most natural that it should have, most unnatural that it should let go. Having found an explanation, it clings to it, and maintains that it is certainly such as can be accepted, that it is certainly true, because a multitude of facts, which by means of it will be reduced to order, must otherwise remain a more or less chaotic and unintelligible mass.

II. It will now be well, in continuation of the comparison already instituted between illation and induction, to consider the nature of inductive assent, and then compare the two assents together. This, moreover, will afford the needed occasion for examining the value of the assent given in illation.

Inductive inference leads, as we know, to a conclusion of the following kind: ABC, being antecedents common to all observed instances of a , and never found on occasions when a is observed to be absent, contain among them the cause of a . To reach this conclusion the mind has, besides the necessary deductive act, done two things. It has withdrawn its attention from all antecedents which appear to it too remote from a to contain a really explanatory cause; and it has by a process of comparison and contrast reduced the number of the antecedents remaining which can by possibility be a cause. Assent to the conclusion means, then, that the mind is satisfied, that the proper range of search has been truly judged, and that the work of comparison and contrast has been performed with accuracy. While the latter point is one of mere observation, the former appears to be connected with the mind's innate conception of causation and its eagerness to find explanatory causes. A cause such as the mind really apprehends and cares to know of as an explanatory cause is one that is to be found in some sort of proximity to the effect. And the mind assents to the conclusion that the very limited collection of phenomena, ABC, contains the cause of a , partly because it has an innate conviction that the explanatory cause, existing and required, is not among the remote antecedents which have been left unnoticed.

Let us now make comparison between the two different kinds of assent. There appear to be three points in respect of which we may compare them. First, we may compare them in respect of their subjective value, by which is meant the degree of certitude present in each in the mind of the individual thinker. Secondly, we may compare them in respect of their demonstrative value, or the cogency of the arguments producing them to move to assent the mind

of any other person before whom they may be laid. Thirdly, we may compare them in respect of their objective value, an expression here used to signify the nearness of the inferred conclusion to actual truth and fact.

1. The certitude of illation, if we choose it in its highest form, appears to be a certitude that of two alternative representations of a multitude of circumstances, one of them orderly and intelligible, the other meaningless and chaotic, it is the former that must be true, and the latter that must be false. If this is so, it is scarcely too much to say, that the mind, in its recoil from confusion and disorder in the external world, clings to an explanation, which substitutes a scene of intelligible order, no less closely than it clings to axiomatic truths. Of course there are lower degrees of illative assent of which this can in no wise be truly said. But apparently, in extreme cases, the assurance with which the mind assents to concrete truths in the field of history may be no less intense than the confidence with which it makes deductions in the field of natural law.

The certitude of induction—if we set aside that of the initial deductive step, and that of the subsequent process of comparison and contrast—appears to be a certitude that an explanatory cause is to be found in some kind of proximity to the effect such as the mind has recognised. It is a certitude that the required cause need not be looked for among the body of antecedents which has been set aside as being in one way or another too remote. This certitude is presumably in some sort of inverse ratio to the magnitude of the body thus set aside. The fewer the antecedents that are rejected, and the more that are retained for purposes of comparison and contrast, the more reason has the mind to be satisfied that it has the cause enclosed in the antecedents remaining uneliminated. But at the same time these remaining antecedents will, in general, be more in number

than if a greater quantity had originally been set aside ; so that the locality of the required cause is less perfectly defined. In induction, then, it appears to be generally the case that, when certitude that the cause is contained in ABC, &c., is very great, the practical value of the inference is comparatively small ; and when the practical value may be great, the certitude that it is so cannot be estimated at a high degree. On the whole, it may perhaps be said, that certitude in the case of inductive inferences actually made, whether or not it is for the most part less than that of illative inferences, never reaches the point which this latter is sometimes enabled to attain.

2. An illative inference is not, like a deductive inference, transferable from one person to another. It does not, merely by means of an able exhibition of the argument, become a common mental possession. The conclusion arrived at by any individual thinker does not depend only upon the facts before him, and the degree of carefulness and acumen with which the evidence is collated. It depends in great measure also upon his own personality. The interpretation of facts must be in accordance with experience ; and the experience of one man is far from tallying in all points with that of another. Two persons, having before them precisely the same body of facts from which to judge, and with anxious care discussing the evidence point by point, may be quite unable to agree upon the true interpretation of it. In so far as particular experiences in relation to the matter in hand are common to both, each will follow the line of investigation taken by the other ; but in so far as experiences are different, each will diverge from the other's path.

But though illative inference thus seems to have, on the whole, little direct demonstrative value, yet indirectly it may do much to compel the assent of other persons. For the

bare circumstance, that a particular conclusion has been arrived at by an individual whose insight and judgment are relied on, is to no small extent regarded by others as a warrant for accepting it as true. And if we find a number of persons, of perspicacity and sound judgment, uniting in testifying their assent to one and the same conclusion from the facts before them, then we ourselves, by an act of illative inference from the several acts of testimony, may not unreasonably conclude it to be true that the circumstance, which they unitedly infer, is indeed a circumstance that has actually happened. The hypothesis of its being a veritable fact may reasonably be looked upon as the only hypothesis which affords a satisfactory explanation of the several inferences that it is a fact. This act of illation performed by us is, it may be remarked, precisely the same in character as the act which would lead us to assent to the united testimony of a number of witnesses who, instead of having severally inferred the fact, should depose each to his own actual knowledge of it.

The demonstrative value of induction, though inferior to that of deduction, must be held to rank above that of illation. We may perhaps assume, that one person can surely carry another with him through the process of elimination by comparison and contrast; but we cannot equally take it for granted, that one can bring another to take the same view as himself as to the body of phenomena that may be summarily set aside. The line of demarcation between the antecedents among which a cause is to be sought, and those which there is no need to take into consideration, will not be drawn, by the consent of all inquirers, in exactly the same place, even when they have precisely the same body of antecedents before them. But nevertheless there will, in general, be no very great divergence of opinion. Moreover, as in the case of illation, so in the case of induction, the

view taken by investigators of known judgment and penetration may, as being their view, commend itself for adoption to other persons.

3. What sort of guarantee is there, we have now to inquire, of the conclusions drawn, whether by illation or by induction, being in accordance with actual fact? Of course a large proportion of the inferences actually made in common life are, from an objective point of view, quite unreliable. If in illation persons are apt to 'jump at conclusions,' so in connection with induction it is common enough to 'make hasty generalisations.' In both the fields of investigation inferences are often drawn, which serve only the purpose of giving temporary satisfaction to a mind eager to understand the phenomena around it, and which in the light of subsequent experience, or on more careful consideration of the facts already known, have to be renounced or greatly modified. But let us suppose a conclusion drawn in the field of history, and another drawn in the field of natural law, from ample evidence and by a person of trained intelligence, and assented to by him with full conviction. What means have we then of assessing the proximity of these conclusions to objective truth?

With regard to an illative inference, it seems to be the case that it must be true only if it is drawn in that part of the field of history to which the experience of the inquirer belongs. We may perhaps take it for certain, that the grouping of causes, if not absolutely continuous in any one corner of the world at any one period of time, is yet so continuous that entire reliance may be placed upon an inference drawn, under strict conditions, concerning an event in that corner and at that period by one who has experience of them. But we do not seem entitled to ascribe the same certainty to inferences concerning events in other corners or at other periods. A wise man, however, when drawing inferences,

will recognise this; he will bear in mind that in many respects the regular grouping of causes varies according to place and time; and he will be careful not to give unconditional assent to a conclusion, unless he is assured that with regard to the matter in question his own experience may properly be taken, so far as it has been taken, to be a sufficient guide. This being so, if a person, at once broad-minded and intelligent, should entertain a deliberate and firm conviction that a particular historical incident is true, we may perhaps take it to be the case, that the fact cannot be otherwise than he understands it to be.

In inductive inference the truth of the conclusion depends upon the inquirer not having rejected as irrelevant all the antecedents which contain a cause. An acute and cautious person may, perhaps, be fully depended upon not to make such a mistake as this. We seem to be possessed of so much insight into the kind of proximity that exists between cause and effect, that a person of trained intelligence is practically secure against regarding as an impossible seat for an explanatory cause the whole body of phenomena in which the causes of a given effect really have their abode. If, therefore, a person, at once intelligent and cautious, should deliberately hold that certain residual phenomena, ABC, contain among them the cause of *a*, it may perhaps be considered that his conviction represents an objective truth.

III. The view here taken of the function of induction does not accord with that of Mill. He claims for his four methods that they, and they alone, are methods of proof. Only by following one of them can causes and effects with certainty be discovered. He writes as follows: "Dr. Whewell's theory of the logic of science would be very perfect if it did not pass over altogether the question of Proof. But in my apprehension there is such a thing as proof, and inductions differ altogether from descriptions in their relation to that element.

Induction is proof; it is inferring something unobserved from something observed: it requires therefore an appropriate test of proof; and to provide that test is the special purpose of inductive logic."¹ "If discoveries are ever made by observation and experiment without Deduction, the four methods are methods of discovery: but even if they were not methods of discovery, it would not be the less true that they are the sole methods of Proof; and in that character, even the results of deduction are amenable to them. The great generalisations which begin as Hypotheses must end by being proved, and are in reality (as will be shown hereafter) proved, by the Four Methods. Now it is with Proof, as such, that Logic is principally concerned."²

It seems a curious thing—or rather it might seem a curious thing, if it were not in keeping with other deficiencies in his treatise—that he makes no formal and serious attempt even to discuss the evidential value of testimony. Much less does he exhibit conditions under which testimony is equivalent to proof. If, then, we may suppose that logic does indeed direct an individual investigator to the ascertainment and proof of laws of nature, on what are persons, to whom it is impossible to follow him in his researches, to ground their assent to the laws which he professes to have discovered? Mill can hardly mean that a true fact or law ought not to be assented to by any one who has omitted to verify it for himself by means of the four methods. And yet, if he does not mean this, he altogether neglects to provide the necessary test of what he must be supposed to acknowledge as a possibly valid kind of evidence.

Let us now—without re-opening the general question of the nature and worth of the four methods—notice two points, namely, the kind of proof to which we are led by the method of agreement, and the kind to which we are led by the

¹ Bk. III. ch. ii. § 5.

² Bk. III. ch. ix. § 6.

method of difference. Concerning the former Mill writes as follows :—

“Suppose that, by a comparison of cases of the effect, we have found an antecedent which appears to be, and perhaps is, invariably connected with it: we have not yet proved that antecedent to be the cause until we have reversed the process and produced the effect by means of that antecedent. If we can produce the antecedent artificially, and if, when we do so, the effect follows, the induction is complete; that antecedent is the cause of that consequent. But we have then added the evidence of experiment to that of simple observation. Until we have done so, we had only proved *invariable* antecedence within the limits of experience, but not *unconditional* antecedence or causation. Until it had been shown by the actual production of the antecedent under known circumstances, and the occurrence thereupon of the consequent, that the antecedent was really the condition on which it depended; the uniformity of succession which was proved to exist between them might, for aught we knew, be (like the succession of day and night) not a case of causation at all; both antecedent and consequent might be successive stages of the effect of an ulterior cause. Observation, in short, without experiment (supposing no aid from deduction) can ascertain sequences and co-existences, but cannot prove causation.”¹

Thus he apparently holds that the proof of a phenomenon, towards or to which we have been led by the method of agreement, being the real cause of an effect is this—that by experiment we can actually perceive that it produces the effect. If this is so, it must be objected, that the test of proof is not provided by logic. Surely it does not need logic to authorise us to accept the evidence of our senses.

Concerning the application of the method of difference he

¹ Bk. III. ch. vii. § 4.

writes thus : " It is inherent in the peculiar character of the Method of Difference that the nature of the combinations which it requires is much more strictly defined than in the Method of Agreement. The two instances which are to be compared with one another must be exactly similar in all circumstances except the one which we are attempting to investigate: they must be in the relation of ABC and BC, or of *abc* and *bc*. It is true that this similarity of circumstances needs not extend to such as are already known to be immaterial to the result. And in the case of most phenomena we learn at once, from the commonest experience, that most of the co-existent phenomena of the universe may be either present or absent without affecting the given phenomenon ; or, if present, are present indifferently when the phenomenon does not happen and when it does. Still, even limiting the identity which is required between the two instances ABC and BC to such circumstances as are not already known to be indifferent ; it is very seldom that nature affords two instances, of which we can be assured that they stand in this precise relation to one another. In the spontaneous operations of nature there is generally such complication and such obscurity, they are mostly either on so overwhelmingly large or on so inaccessiblely minute a scale, we are so ignorant of a great part of the facts which really take place, and even those of which we are not ignorant are so multitudinous, and therefore so seldom exactly alike in any two cases, that a spontaneous experiment, of the kind required by the Method of Difference, is commonly not to be found. When, on the contrary, we obtain a phenomenon by an artificial experiment, a pair of instances such as the method requires is obtained almost as a matter of course, provided the process does not last a long time. A certain state of surrounding circumstances existed before we commenced the experiment ; this is BC. We then introduce A ; say, for instance, by merely bringing an

object from another part of the room, before there has been time for any change in the other elements. It is, in short (as M. Comte observes), the very nature of an experiment to introduce into the pre-existing state of circumstances a change perfectly definite. We choose a previous state of things with which we are well acquainted, so that no unforeseen alteration in that state is likely to pass unobserved; and into this we introduce, as rapidly as possible, the phenomenon which we wish to study; so that in general we are entitled to feel complete assurance that the pre-existing state, and the state which we have produced, differ in nothing except the presence or absence of that phenomenon. If a bird is taken from a cage, and instantly plunged into carbonic acid gas, the experimentalist may be fully assured (at all events after one or two repetitions) that no circumstance capable of causing suffocation had supervened in the interim, except the change from immersion in the atmosphere to immersion in carbonic acid gas. There is one doubt, indeed, which may remain in some cases of this description; the effect may have been produced not by the change, but by the means employed to produce the change. The possibility, however, of this last supposition generally admits of being conclusively tested by other experiments. It thus appears that in the study of the various kinds of phenomena which we can, by our voluntary agency, modify or control, we can in general satisfy the requisitions of the Method of Difference; but that by the spontaneous operations of nature those requisitions are seldom fulfilled."¹

With regard to this it must be objected, that here again the proof is connected, not with logic, but with sensation. If it is indeed by the method of difference that we prove the death of the bird to be due to immersion in carbonic acid gas, then we must have two sets of effects—namely, the bird, and

¹ Bk. III. ch. viii. § 3.

the bird with the added fact of death—and two corresponding sets of antecedents—namely, X, and X with the added fact of immersion in gas. Now let it be granted, that in consequence of legitimately neglecting as immaterial a number of antecedents, and of perceiving that the others remain the same before and after the experiment, we have the condition as to the two sets of antecedents rigidly fulfilled. Let there be no question, that is, that immersion in carbonic acid gas is a separable cause of some effect. It has then to be considered, how we become aware that it is the death of the bird of which it is the cause. Is the dead bird precisely the same thing as the living bird together with the added fact of death? Surely the only ground on which we can affirm this is, that no change in the condition of the bird is apparent to our senses except the addition of the phenomenon of death. But this, apparently, is equivalent to saying, that we know by means of sensation that immersion in gas has death as its effect, or is the cause of death. Hence it appears that Mill's method of difference, with its two cases and its sure conclusion from them, is not really a method of inference at all. What it professes to do is, in fact, accomplished directly through the instrumentality of sensation.

IV. It remains to say a few words on the subject of assent in relation to belief. A proposition assented to is not necessarily a proposition believed. That is to say, we seem able to distinguish between two attitudes of the assenting mind towards an inferred truth in respect of a subsequent relation to exist between them. The act of assent may be regarded by the mind as a purely intellectual act; or it may be an act which is felt to carry with it consequences, immediate or remote, in the sphere of conduct. A fact merely assented to is a fact which is seen to harmonise with some group of images previously existing in the mind; a fact believed is one which is received as a member of the central body of

coherent representations of the world in accordance with which conduct has to be determined.

This distinction being drawn between assent and belief, three remarks seem to be called for.

1. It will to a great extent depend upon the form in which assent finds its natural expression, whether or not it may be considered as rising to the dignity of belief. A simple apprehension and admission, that this thing or that is a true fact of history or of natural law, does not seem to be, in general, a mental act with which we should feel strongly called upon to make our subsequent conduct harmonise; or which, in the case of other persons, we should look to as affording a reliable indication of their behaviour. If, however, we ourselves, or other persons, assert that this thing or that cannot in reason be supposed to be otherwise than it is alleged to be, then we are conscious that conduct will be expected not to be inconsistent with this conviction. A thing concerning which we are able to express ourselves thus strongly is a thing which we believe, suffering it to exercise a real influence upon our actions.

2. Apparently it is a possible and a not unusual thing for the mind to entertain at the same time two contrary opinions, if it has merely assented to them. They may harmonise sufficiently well, each with its own group of facts, for the mind, not thinking deeply, to be able to admit the truth of both. If, however, their truth is subjected to a severer test, if the mind seeks to introduce them both into the inner circle of more or less permanent beliefs, their contrariety is likely to be discovered. The constant searching among these beliefs for uniform guidance as to what is natural in conduct—which searching is, apparently, a part of our moral life—will necessarily do much to reduce them to a state of consistent order.

3. Whether or not the will is at all concerned in a simple